

GYMNASTIC PROBLEMS

JAKOB BOLIN



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BY

JAKOB BOLIN

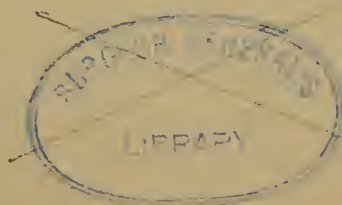
LATE PROFESSOR OF PHYSICAL EDUCATION, UNIVERSITY OF UTAH;
FORMERLY DEAN OF THE CHAUTAUQUA SUMMER SCHOOL OF
PHYSICAL EDUCATION; AND INSTRUCTOR IN THE NEW
YORK AND NEW HAVEN NORMAL SCHOOLS OF
PHYSICAL EDUCATION

WITH AN INTRODUCTION BY
EARL BARNES

ILLUSTRATIONS FROM PHOTOGRAPHS



NEW YORK
FREDERICK A. STOKES COMPANY
PUBLISHERS



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FOREWORD

At the time of his death, Professor Jakob Bolin had completed the manuscript the contents of which appear in the following pages. It had been his intention to add other chapters and to illustrate and publish the work, but he died before this could be accomplished. Dr. Jay W. Seaver, a former colleague and intimate friend of Mr. Bolin, took over the manuscript with a view to publishing it, but within a year, before the work was under way, he also died.

Feeling strongly that Professor Bolin's manuscript is one of the most important contributions to the subject of gymnastics which has been written in English, we, as a group of his associates at the University of Utah, thereupon undertook the task. With the courteous co-operation of the publishers, and of Professor Earl Barnes, who furnished the introduction, we are now able to present the book to the public. The illustrations and minor changes in the text are our own; for what they lack, we alone are responsible.

We cannot refrain from taking advantage of this

opportunity to express our love and profound admiration for Mr. Bolin, whose delightful personality and unusual professional attainments made him admired and esteemed across a continent.

INTRODUCTION

In his pursuit of civilization man is continually reaching conditions which threaten to destroy him. For protective covering, he substitutes fashionable costumes; in place of a nourishing diet, he develops a sense-commanding and overstimulating course of entertainments in eating; for healthful exercise, he substitutes ease and sedentary habits; fresh air gives way to over heated and over used interiors. With these abuses of his physical life come new diseases; heart and kidney troubles and pneumonia sweep away the slaves of civilization.

And for this tendency to self-destruction there are but two correctives. One is through Rousseau's return to nature, and the other is through more civilization, more intelligently conceived and executed. When we have built our house so well that it not only shuts out the storms but also the fresh air, then we must either tear down the house or set up an engine in the basement and force fresh air through the rooms. It is clear that for men there is no going back in civilizational development. Nothing could be more artificial than for a civilized

man to return to the woods. Once under way, we must go on to higher levels or perish.

The most far reaching of all the evil consequences of our civilization gather around our artificial activities, and lack of activity. Our bodies have not had the development that comes through out-of-door work and play in childhood; and in maturity we live in mines, factories and libraries. Not only the bony framework and the muscular system suffer, but all the more delicate machinery of digestion, circulation and respiration is disturbed and impaired. The nervous system, being badly nourished, fails to do its best and man faces destruction.

The corrective for this condition lies in gymnastics. Vacations, walks, golf, tennis, riding and the like will help maintain physical vigor but they are only lunches and refreshments taken between meals. Well-considered gymnastics must make the physical diet of modern man. The body must have regular exercises if it is to be kept in its best estate.

With children, this is especially true. Their bodies are to be shaped and developed on lines of efficient action. They are to be strained and toughened into their full power of resistance. Incipient weakness or malformation must be detected and corrected. Everyone knows this, but how slowly do we respond to our knowledge! This is partly

because the training of a sound and beautiful body is no simple task. It requires profound knowledge of anatomy and physiology, with skill in devising exercises that will give the maximum of training with the minimum of waste and danger.

Just now, when all the world is facing war and the need of the physical efficiency that makes successful armies, this book should make an especial appeal to America. For military preparedness, we must have, in the first place, a country worth fighting for, and in the second place, strong men and women. Military drill and munitions can be provided if a nation has ideals and men. Gymnastics will give the best of military preparedness, with the minimum of disturbance to our peaceful ideals.

We have no one in America better prepared to write on this subject of gymnastics than was Mr. Jakob Bolin, the author of this volume. He brought to the task a most thorough training in anatomy and physiology, through his study in Sweden which he extended and perfected with each year of his life. In his work in America he trained thousands of teachers who revere his name, while in his Institute in New York, he dealt with every form of physical defect, requiring ever fresh consideration and special treatment.

His thinking was always scientific, in the best

sense of the word. He spared no pains in determining facts, and no theory could stand in the way of a fact. With the facts in hand, he set to work to realize all that was possible. No labor was too great for him; and his standard of achievement was always as far ahead as he could see. He was a scientific humanist; and these pages from his pen will be eagerly prized by all who knew him, and will make those who did not know him regret that he wrote so little.

EARL BARNES.

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GYMNASTIC PROBLEMS

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CHAPTER I

OUR AIM

It shall be my privilege to formulate more or less definitely certain problems in the work of the teacher of gymnastics and to point out the direction in which I see their solution.

To do so it is necessary first to take a rapid glance at the place which gymnastics is supposed to fill in our time, or, in other words, to establish what the aim or aims may be of its introduction in our lives.

Note, then, that our profession is born at a comparatively late period of social evolution. It is a product of a comparatively high civilization, of a rather complex life. The lower the civilization, the simpler the life we lead, the more easily do we fit into the environment, reacting properly to its stimuli, and the less need there is of any particular preparation or education in any direction. The preparation which the individual needs he gets incidentally from his mode of life. It is a natural

training, which tends to make of him more or less of an automaton, reacting unerringly, and more or less unconsciously, to the influence of the environment, very much as a bear cub or a young chicken does. This natural training gives, however, small power of adaptation to changes in the environment. The automaton acts well within certain well defined limits, but it fails when new modes of reaction are required daily and hourly, because of the complex nature and everchanging character of the environment. Then there seems the necessity of introducing artificial means by which the individual learns to adjust himself to the great variety of the conditions surrounding him, and to choose consciously or unconsciously, among many possible reactions the one which is best adapted to meet both present and remote conditions. Education is the artificial means invented by man, as a reasoning being, to supply the needs which natural training cannot supply. Gymnastics is the most artificial and formal part of physical education, and is the last part to make its appearance. When life's duties become chiefly intellectual; when the physical activity is taken out of it; when the individual becomes confined to cañons of brick and mortar instead of being able to roam over hill and vale; when he becomes tied to a machine or an office desk, in-

stead of making his living by stalking the deer; when he hugs the stove and uses artificial light to dispel the gloom created by himself, instead of basking in the sun with the winds playing freely around him; when he finds that his gains in many directions are bought by a loss of something in other directions; and when he comes to the conclusion that the loss is due to the decrease in physical activity; then he does not turn to gymnastics as a help. He instinctively tries to return to his natural ancestral life. He goes tramping through the woods, as his forefathers before him, in search of game. He goes fishing, hardly expecting but always hoping to catch something. He is not a fisherman, but a sportsman. It is not the fish he wants. He can buy them cheaper. He wants the joy and the pleasure, the relaxation and the excitement, the change of activity from intellectual sensory to intellectual motor. He takes his vacations in the mountains or at the seashore. He roughs it. He doffs the garb of civilization to commune with Nature.

But measures like these are sporadic and unsatisfactory. They are costly in time and money. The virgin forests fall by the woodsman's ax. The fields are taken up by the farmers. The beaches are filled with summer resorts, vying with the cities in their artificiality. He is everywhere met with signs

warning him of "No trespassing here," "Keep off the grass." He finds it more and more impossible to be natural in his activities, and seeks a substitute in plays and games of olden times, perhaps modified to be within his easy reach. He invents new ones to suit the contingencies of his life. He plays football, golf, tennis, goes rowing or canoeing. But civilization means evergrowing urbanization. The necessary facilities for indulging in these sports become more and more inaccessible to an evergrowing percentage of our population. The games are played less frequently, and at greater expenditure of time and money. Then the citizen begins to feel that the physical activity which he craves must be brought directly into his home or office, or at least next door to him. He also demands that it shall be concentrated and regulated so as to affect him most favorably in the briefest possible time. He cannot afford to rely upon chance. He wants the matter studied, systematized, formulated, so that he may gain with reasonable certainty just the effects most desirable to him. Gymnastics, the most formal and artificial, the most systematized of all branches of physical training, enters to fill the needs of the citizen in a highly organized community.

So I picture to myself the racial development of gymnastics. And as everywhere else we find a re-

capitulation of its essential features when we consider the individual. The infant's play is essentially the instinctive reaction to the environment. The form of the movements, their intensity, their speed, their sequence, are determined by extraneous circumstances, not by the reasoning powers. Any change in the conditions brings immediate corresponding varieties in the activity. That is the natural training period. But the child grows and enters into communion with his kind, becomes a part of the community, and begins to reason. When his unregulated activity comes in contact with that of others, the activity of all becomes subjected to direction of reason. The immediate interests of one become subordinated to those of all, division of labor appears, rules are formulated, to which each submits, and, because of which, each inhibits his activity in one direction in order to supply it more particularly in another. There is a gradual transition to the highly organized games, many of which resemble primitive man's vocations, hunting and warfare. The organization grows more and more complicated, the division of labor is carried farther and farther. The general training disappears, a onesided one takes its place. And the individual finds the necessity of supplementing his onesided training in one direction by onesided training in

another direction. Sooner or later the young man or the young woman lands in the gymnasium to find in its artificial methods a substitute for nature's training.

I thus emphasize the artificiality of gymnastics. This does not signify its inferiority to the so-called natural methods. Far from it. Difference is not inferiority. There are certain benefits coming from physical activity which are secured very much better and more easily by other methods of training than by gymnastics. But the much vaunted superiority of the so-called "Nature's own way" is much exaggerated. Those who make the distinction between the artificial and the natural, that the former is always bad, the latter always good, are making a grievous mistake. To be logical they should condemn civilization itself, because civilization is artificial. It is natural to tell the time by the position of the sun. It is artificial to use a watch. But the latter is more precise. The trouble seems to lie in a confusion of the terms artificial and unnatural. In many features our civilization is unnatural. But these are unessentials. All the essentials are natural, in accord with the results of Nature's own laws. The raw material springs from Nature unaided, the finished product is the result of reason applied to Nature's product. The



FIG 1.

A simple movement of the upper arms in the plane of the shoulders. (*See page 35.*)



FIG 2.

Common bad form in the "wing" position. (*See page 36.*)

same relation holds good in physical training. Tracking, felling and bringing home a deer is a kind of raw material of physical activity. Gymnastics is the selection of the raw material, its combination in various ways, its polishing until the natural product is made more suitable for the needs of civilized man.

What are these needs? Why do people generally take to some form of exercise? Why do they go walking, bicycling, or horseback riding, when they do not need it for getting from one place to another? Why do they play tennis or golf?

Why do they frequent the gymnasia? And, by all means, why do so many profound thinkers urge the necessity of supplying our school children with physical activity of this and other kinds? This last question is important because its answer may not coincide with the answers to the former questions. The individual who turns to physical activity, not because of any knowledge on the subject but simply because of an indistinct feeling or desire for it, may be able to give us hints, but it is those who have given deep thought and careful consideration to the subject to whom we must turn for definite information.

The former will probably tell us that he looks for recreation, for relief from strenuous mental ac-

tivity, for pleasure, for joy, and because it is a matter of general experience that at least a certain amount of physical activity is necessary for the maintenance of physical health and vigor, and that his sedentary life does not give him enough of it.

The student will speak of these two points as desirable in the highest degree. He will tell us that "all work and no play makes Jack a dull boy." He will point out that civilization has tended and is tending to supplant muscular labor at such a rate that not only the professional man has been deprived of the vigor which comes from physical activity, but the introduction of machinery has dispensed with the severer muscular labor also of a large number of workmen who are now becoming parts of the machines they tend, limited mainly to pressing the button or some other similar small acts, and that their general health deteriorates as well as that of the professional classes because of the small amount of physical activity. But he also tells us that the reintroduction of physical activity into the life of civilized man is necessary not simply because of the general lack of such activity in our daily vocation but still more for the purpose of counterbalancing such activity as still remains. He will call our attention not only to the insufficient amount of physical labor performed by our physi-

cians, lawyers, clergymen, teachers, business men, and factory workers, to sustain health, but will emphasize the narrow limits within which the labor of the blacksmith, the farmer, the general laborer, is confined, even though this labor be prodigious in quantity. He will maintain that the highest degree of vigor cannot be built merely on a certain quantity of physical activity, but asserts that to assure the greatest amount of physical well-being the activity must be harmonious, distributed over the whole physical man. He will point out that the school curricula not only supply an insufficient amount and too few forms of physical activity, upon which to sustain that degree of health necessary to serve as a solid foundation for education, but that they are deficient also in as much as they ignore the direct influence of physical activity upon mental and moral development. He will recite to us the loss in these respects which has come when many of the educative duties of the home in a primitive community have necessarily been dropped with the oncoming of more highly civilized stages, without being taken up by the school which should naturally inherit them. The participation of the child in the many duties of the home, doing of chores, helping in supplying the family with the means of subsistence, all that is practically gone from the civ-

ilized home, and with it a wide gate to knowledge has been closed, an educative means of the highest value has been swept away, and nothing has come to take its place. Physical training in its various aspects is supposed to fill the vacuum, at least to some extent.

The purpose then of physical training is recreative, hygienic, in both a general and a special sense, and educative.

It is self-evident that though the general purpose of physical training has many aspects, all of which should be duly considered by those who are in charge of the work, one or the other view-point may become of paramount importance in certain classes. It is also self-evident that the great variety of physical activity at our disposal makes it possible to vary the means employed, so that different procedures which more readily yield recreative results may be used when recreation is the main object in view, while others more effective in a hygienic sense should attract our attention under different conditions.

Thus if I seek the means best adapted for furnishing recreation, all will agree that for both child and adolescent, and even for adults, play, unorganized or organized, takes the first place. Gymnastics can and shall furnish recreation, because

that is part of the purpose of physical training as a whole; but it would be bad policy to give gymnastics particularly for that purpose when other and more effective means are at hand. The recreative aim of physical training should be sought mainly on the playground, if such exists or can be obtained, not in the gymnasium except when conditions absolutely prohibit us from applying means by which the most recreation can be gained with the least waste of energy.

The amount of physical activity necessary for a person engaged in exclusively intellectual or small mechanical fields may be supplied in many ways. If you, like Gladstone, have opportunity to fell trees, you may well do so, sure that thereby increased vigor will be your reward. If you can buy a suburban home where you can dig, and hoe, and serve as general utility man, you will benefit from it. If you can get a horse for a morning ride; if you can join a golf or tennis club; if you can indulge in any of the many forms of sports open to persons of means and some degree of leisure, then by all means make the investment. It will pay good dividends. But for the great majority of people whose opportunities for these forms of activity are limited; for the mass of school children, who cannot pitch a ball on the street for

fear of hitting a staid old citizen on the head, who cannot run the bases without bumping into a baby, who have no space to move in large ways,—for these, for the common people, for the growing generation especially, the gymnasium is, perhaps not the best, but the most convenient place in which they may have their needs fulfilled. Gymnastics is not a form of activity absolutely necessary for maintaining general health and vigor. It will probably be less prominent for that purpose, as parks and playgrounds come to be universally recognized as necessities of city life, when we become civilized enough to acknowledge that no man's life should consist merely of slaving, sleeping and eating. The general hygienic purpose may, at least partly, be gained by less formal exercise, but as a matter of fact, it is not usually secured by these means by the majority of the people, and the gymnastic teacher will be failing in his duty if he does not see to it that a large amount of work is accomplished in his classes, whatever the forms may be that he uses.

But, however important for hygienic purposes it may be that the individual has a certain quantity of physical activity, quantity alone does not suffice to secure the greatest possible vigor. The vital organs, even though healthy, must work under the

most economical conditions. We do not need to enter into detailed explanations, for instance, of the great waste in energy expenditure which results from that common faulty attitude which is characterized by exaggerated spinal curves, abducted shoulder-blades, and relaxed abdominal walls. It may perhaps be permitted simply to record here the conviction that this attitude, so prevalent among all classes and at all ages is, perhaps, sapping more energy than any other one factor. It means lessened space for the heart and the large vessels; it means a mighty decrease in the respiration; it means the withdrawal of a large part of the influence of the respiration upon venous and lymphatic circulation; it means a diminution of that natural massage by the diaphragm and the abdominal walls from which the abdominal viscera should derive benefit; it means the lack of support normally given these organs; it means, in brief, unfavorable conditions for practically all the organs upon which our nutrition, circulation and elimination depend.

To prevent the development of these unfavorable conditions becomes one of the most important duties of society, and physical training is the proper means for it. This is our specific hygienic duty. But the games and the sports are, as a rule, unde-

terminated and general. The forms of the movements are not selected directly with a view to their effects upon the organism but in order to accomplish a definite external task. The activity in them is of the same general kind as that in the professions or trades. It is mainly flexor activities. And games and play and sports and athletics cannot therefore supply the necessary corrective influence except in quantity. They themselves need to be supplemented by corrective agencies. I believe nobody will gainsay the assertion that our athletes are not, as a rule, particularly good models as to carriage. An exception should be made for our oarsmen, which have in their activity excellent correctives to other athletic and professional work. With the severest forms of competition eliminated, I believe rowing would be as near an ideal exercise as any one form well could be. But it is available only to the few, and practically the only road open to us, if we wish to secure to the growing generation the benefits of an erect carriage, a harmonious development with all that it implies of vigor, efficiency and beauty, is to select particular formal exercises—gymnastics.

The purely educational benefits, which gymnastic training is expected to furnish, are so manifold, and it is in their contemplation that we first become



FIG. 3.

A corrective exercise with the upper arms in the plane of the shoulders. (*See page 35.*)



FIG. 4.

Unless care is exercised, the elbows and head are likely to be carried forward. (*See page 36.*)

really aware of the necessity of placing physical training upon a broad foundation.

But let us, who deal with gymnastics, be frank enough to acknowledge that the formal training, however valuable it may be in this regard, can furnish very little indeed of those benefits compared with the less formal and more spontaneous exercises. The gymnastic teacher should of course not forget his duty to help in developing power of attention, in educating sense-perception, in stimulating will, in making each pupil fit to assume his place as an active member of society cooperating with others. If he forgets this, he fails in one of the most essential features. But is it not a fact that what our educators mainly ask from physical training is that it shall give the pupil a better knowledge of and belief in himself, a desire to overcome obstacles and defeat difficulties? That physical training shall steel the courage, make the individual feel a longing to be in the midst of the fray, develop men with initiative and aggressiveness, men fit to lead in any enterprise, men on whom we can rely to carry the civilization a step further, men who do not leave the school or college behind them on the day of graduation but who take it with them into life, carrying it and the benefits of education into whatever place they may have to fill, men of whom

it shall not sneeringly be said that their education has made them unfit for practical life, but who must be recognized as eminently practical, not in spite of, but because of their deeper learning, men who not only have been passively filled with the wisdom of books, but who have been trained well in both thinking and in doing. And men of that type are not created by formal activity, such as is the chief characteristic of gymnastics, even though they may be rounded off thereby. They are made on the football field, in the shell, wherever competition enters fiercely, where presence of mind, control of the body and dogged persistence are demanded, not where activity is regulated by a commanding leader, or thumping on the piano, or where each goes forth to do his stunt and then retires, but where each watches his opportunity to sail in with all his might when needed, where each relies upon his judgment.

The particular aim of gymnastics, then, the aim which can be gained by no other branch of physical training, is what we have spoken of as hygienic in a special sense, to counteract the evils of one-sided activity. Those who, with me, so see the main object of gymnastics are frequently criticized for their narrowness. They would be narrow if they refused to see anything but this circumscribed field.

But the mere fact that they distinguish between this particular field and the broader one of physical training does not make them narrow. It rather guarantees that within that particular field they will do their work far better than if they endeavored to gain results by their work which can be better gained by other means; far better than if they confound play with work: far better than if they encouraged the one already efficient at the expense of the one who is backward. May the teacher of gymnastics ever have a clear and vivid conception of the limitations of his own work so that he does not enter into fields which are not his, dissipating his energy and that of his pupils in futile endeavors to gain that which gymnastics cannot gain. But may he at the same time remember that the gymnastics is not the end. It is only one means among many for a given end, the development of citizens of the highest order; citizens with a straight back and well poised head, to be sure, but who need far more than that, who need all that physical training can give, all that education can give.

It is poor gymnastics when the teacher is unable to furnish that which should be brought forth by the gymnastic exercises better than by any other means. It is poor gymnastics when fun becomes the chief end instead of the condiment giving the

necessary zest. It is poor gymnastics when the main object is to expend a certain number of foot-pounds of energy to secure increase in cardiac and pulmonary activity, without care being taken that these organs are put under the most favorable conditions to meet the increased demand upon them. It is poor gymnastics if we strive to astound the world by nicely finished and smoothly gliding combinations of complex movements fit to be put into the repertoire of a juggler, or by exhibitions of strength vying with those of a Sandow, if we do not take into consideration the effects on the vital functions. But poor as all this is, poorer still is the gymnastics if we forget that we deal with human beings, not with machines; if we kill the souls of our pupils by formalism believing that we care properly for their bodies, if we act as if we were burdened down by an overload of method instead of being guided, directed, carried by common sense.

It is because of the necessity to emphasize this broadness of view that I consider it better to speak of developmental gymnastics, rather than to use the narrower terms, recreative, hygienic or educational.

Physical activity of a formal kind is used also for therapeutic purposes, to influence directly the

organism in regaining its harmonious functions when lost. And hygienic measures are curative in a certain sense, and the common forms of gymnastics may therefore well be considered in relation to actual disease. But the gymnastic teacher should not consider himself as a mechanical physician. Even if he possesses the adequate knowledge, which he but rarely does, there comes the practical impossibility to apply the most effective therapeutic measures to classes. Diseases cannot be treated in wholesale. Each individual must be considered. Treatment must be individualized. That typical defects prevalent in a large percentage of our classes should receive due attention is true, but this does not vitiate the general statement. When a class of school children present a general picture of Kyphosis, we shall of course especially adapt our means to conquer it, as it is our duty to prevent the tendency to this deformity common in all classes. If we have to deal with a class of nurses or saleswomen, we may expect a large percentage to have weak or flat feet. Naturally we will then lay added emphasis on suitable means to prevent or conquer that deformity. But it is not our duty to go around with an anxious eye to discover defects in each individual for the purpose of curing them. If our work shall be directed to the benefit of the

great majority we meet, we must adapt our means to the average normal individual, not to the perfect one, but just to the average one with tendencies to defects in many directions, but with no developed diseases or deformities. Those who have such developed diseases should be weeded out from the general class by suitable medical examination, and subjected to the treatment best adapted to them. One of the means may be gymnastics, individual or in classes. But that is then a specialized form that is distinguished from the usual classwork, the consideration of which is a matter distinct from the purpose of this work.

Persistent exercise is necessary to gain or maintain that dexterity required in many trades or professions. The prestidigitator will soon lose his skill if he takes too many days off. The piano player becomes master of technique only by constant practice; the carpenter learns to hit the nail unerringly, to plane the board to a right angle, only by practice; the danseuse must practise daily. Such specific preparation has usually no connection with our work, though it may have. If we have to deal with a class of firemen, for instance, it seems but natural that even though the fundamental exercises were similar to those used in a class of clergymen, we would in the former case

use a number of applications which would be closely related to the business of the men. Many forms of climbing, wall-scaling, and balancing at great heights, might be suitable.

A considerable number of persons believe that it is our duty to practise in the gymnasium such movements as exercises which all of us might perform in daily life. They say, for instance, that everybody bends forward many times each day. They should then be taught in the gymnasium to do this with the least expenditure of energy. Everybody must walk upstairs several times a day. We should teach them to do this, so that waste and injury be prevented. Everybody sits down on a chair and rises many times a day. Teach the students to do so properly. I cannot agree to this view. If we give general power of coordination, if we teach our pupils to husband their resources and expend their energy economically, we need not make the application in all the common activities of life. We may safely leave that application to the unconscious training of life. Our duty to counteract general vicious tendencies is paramount, not to deal with special cases.

To summarize: Gymnastics, such as we have to consider, is primarily for the hygienic purpose of creating correct habits of posture and movement, in

order that vigor may be maintained at the highest possible level, and of preventing the evils of any one-sided activity. In doing this, we shall, as far as is possible without interfering with our chief purpose, furnish recreation, correct common defects and create desire for activity, always furnishing a quantity of activity sufficient to maintain a high degree of vigor.



FIG. 5.

A simple position involving static activity in the dorsal region.
(See page 35.)



FIG. 6.

Errors of form commonly seen when an attempt is made to assume the position indicated in Fig. 5. (*See page 36.*)

CHAPTER II

THE PRINCIPLE OF GYMNASTIC SELECTION

IN the discussion of the benefits which we may reasonably expect from physical training, we have already seen that different aims necessitate the use of different means. When our main object is of that special hygienic nature which we have endeavored to define, we must turn to the formal gymnastics instead of rivetting our attention to play, games and sports, however necessary parts of a complete physical training these may be.

When we now turn to a consideration of gymnastics as a part of physical training, we immediately find that a new selection is necessary. All possible formal movements cannot be utilized with equal benefit. A sifting process must be undertaken. There is no difference of opinion in this regard. All agree that the object in view cannot be attained without a careful choice of exercises.

The principle of gymnastic selection is thus universally recognized. But as men differ as to the most important aims to be reached, so they naturally employ different means, and though all sys-

tems accept the principle of selection, the practical application of this principle varies according to the view point. He who considers that gymnastics must first and foremost counteract and supplement the daily activities, must differ in his practical work from him who sees in gymnastics a preparatory training for these activities. There is a strong tendency among partisans of one system or the other to ascribe differences in procedure to the ignorance of the opponents, when they in reality are based upon different conceptions of the fundamental object of the gymnastic instruction.

When we now proceed to exemplify the principle of gymnastic selection, we do so with the understanding that the chief aim is the special hygienic one, and that our selection is not binding on any one who differs from us in this fundamental matter. To those who do not segregate gymnastics as a distinct part of physical training, with specific objects which can be gained better by gymnastics than by the other branches, but who believe that all forms of physical training fill exactly the same needs, we cannot speak intelligently. Our fundamental thoughts differ.

The hygienic effects being foremost in our mind, external hygienic conditions,—proper air, light, clothing, sufficient time for the lessons, proper re-

lation of the hour of the lesson to meals and sleeping hours, to the nature of the studies immediately preceding and immediately succeeding it, etc., etc., should of course demand our closest attention. I pass over the matter here because there is a fair degree of unanimity in our circles as to what is necessary in these regards, even if the requirements are not usually fulfilled. I cannot refrain from saying that the need for an abundance of fresh air and light should call the gymnastic teacher out of doors with his classes much more frequently than is the case as present. It is not here a question of substituting out-door play for the gymnastic lesson; it is a question of taking the gymnastics out of doors. Every gymnastic teacher who has at his disposal a free open-air space, even if it be no larger than his gymnasium floor, should utilize it whenever he is not obliged to be indoors.

The indoor gymnastics should be the exception, not the rule. In southern England, Mme. Bergman Osterberg has a Normal school of physical education, where all lessons are taken out of doors except on about a dozen days each year, when the severity of the weather forces the class under cover. That is as it should be. When a Normal school has such a policy, then it becomes ingrained in the graduates that indoor work may be a necessary evil,

sometimes, but it is always an evil. I believe the reason that we do not have more gymnastics out of doors is simply inertia. We are used to the routine indoors, and to break the routine requires some little energy. Many of us are also so wedded to particular forms of apparatus, that we fear to work without them. Let us work for outdoor gymnasia with all the apparatus to which we are habituated indoors; but if we cannot get them, let us remember that the only absolutely necessary apparatus for good work is the human body. And if we have no other apparatus, let us utilize that under the most favorable condition,—out of doors.

Given the necessary hygienic conditions, we must study the exercises themselves and their physiological effects in order to make our selection.

It is common knowledge with every boy who takes any interest whatever in physical exercises that activity gives to the muscles increased strength, and that this strength is, in some way or other, related to the size of the muscle. And with pride he points out his gain in this respect. He often works with the aim in view to build up his muscles. He wants to be strong. He desires muscles which swell powerfully with each contraction. He glories in increased measurements. This seems quite natural. But is it equally plain that it shall

be our duty to encourage him to develop special strength? We know of course that every one should have muscles of such strength as will enable him to fulfill life's duty. We know that the muscles are the executive organs, without which no work can be performed. We know that moderately strong muscles are necessary for the maintenance of health, vigor and virility. We know that if we have weak and flabby muscles, not only does our health suffer, but our intellect is apt to remain potential only; our morality is apt to be of that flabby kind which finds no expression in deeds.

But have we any right to suppose that the benefits due to muscular development accumulate *ad infinitum*? Have we any basis for an opinion that the larger the muscles, the better the general health, the greater the general efficiency? And do we not as a matter of fact encourage that idea among our pupils, when we include a number of measurements of muscular girths in our anthropometric tables, or, even if we do not directly encourage it, when we stand passively by while our pupils assiduously work for "improvement" in these measurements? Are we not responsible for the spreading of erroneous ideas when men, whose names are household words among us, and to whom the public looks up as leaders in physical training, arrange annual

strength tests, in which the students are encouraged not only to partake, but for which they are urged specially to prepare themselves by piling up the muscular masses necessary to break the records?

The strength tests have been taken up by college after college, of course with the tacit understanding that valuable benefits accrue from abnormal muscular strength. But where are the data upon which this opinion is based? Has any lucid statement ever been made of these supposed benefits? Or can such a statement be made? As long as we have no basis of facts upon which to support a belief in these hypothetical and vague benefits, it behoves us well to go slow and not encourage exercises tending to develop abnormal volume and strength of muscle. The time has passed when man must mainly rely on muscular strength to succeed in the struggle for existence and advancement. Moderate activity, well distributed, is sufficient to develop that volume and strength of muscle which are necessary to carry on the business of life easily. To develop more than is necessary is a dissipation of energy, just as much as in an industrial or social organization it is poor economy to provide for a greater executive or clerical staff than is absolutely necessary. The means of subsistence must come out of the earnings of the producing force. Un-

necessarily large muscles sap the energy of the individual. They direct to themselves an undue share of the nutriment, leaving less to carry on the functions of other organs, just as much as an unnecessarily large standing army is a severe drain upon the producing force of Society. It is true that with the growth of the muscles, the organs which have to do with the nutrition adapt themselves to the increased demand. The stomach will digest food better than before; the heart will increase its pumping force, and so on. It is upon this ground that the general hygienic effect of muscular exercise is based. But if all the increment in power of nutrition be expended in the maintenance of muscular bulk, nothing is gained in the direction where gain is most needed. The individual does not become a better functioning intellectual being, but sinks to the level of a muscular monstrosity. This has been pointed out so frequently, so persistently, by our most prominent thinkers, from Galen and Hypocrates to Herbert Spencer, that it is indeed remarkable that it is not yet universally heeded, but that not only the public, the uneducated public, turns with admiration to professional strong men, but that leaders among us still glory in the production of lists of "the one hundred strongest college students."

Generally speaking, the necessary muscular strength is gained incidentally and we need not devise special exercises for the purpose of gaining it. We may, and shall, on the contrary, devote our attention to secure more important effects. Especially may we consider it a superfluous, useless, and even detrimental labor to strengthen the muscles of the arms, the legs, and the pectoral groups.

The arms and legs are usually sufficiently well developed muscularly to carry on their duties. If they are not, they will soon be so, if they are put to perform those duties, provided the general condition of health is satisfactory. But to take exercises on pulley-weights to develop the flexors of the arms, or to cause the pupil to rise on tiptoes from ten to a couple of hundred times in rapid succession in order to secure large calf muscles, or to tug at a wrist machine to strengthen the forearms,—these and similar procedures are not permissible. They are not conducive to health: they take up much valuable time which might be very much better utilized; their object, the increase of muscular strength should, so far as it is desirable, be secured with more natural, less mechanical procedures,—by climbing, by rowing, by walking, all of which have their legitimate place in physical training.

The pectoral groups are habitually employed in



FIG. 7.

A type of activity effective in preventing abduction of the shoulder blades. (*See page 35.*)



FIG. 8.

If the elbows and shoulder blades are allowed to move forward, the activity indicated in Fig. 7, becomes of little value. (*See page 36.*)

daily activities. They are commonly as strong as the individual needs. To devise special exercises solely for their further development in strength is not only unnecessary and time robbing,—it brings on actual injuries, of which more anon.

We are, however, warranted in developing muscular strength in such regions which, during our normal vocations, have a minimum of activity, or an activity which is of such a nature that thereby the harmonious development of the body, necessary for the best functioning of the vital organs, becomes destroyed. There are particularly three such regions. The abdominal wall is rarely called upon to perform any labor worth mentioning, gravity bending the body forward. The abdominal muscles besides being inactive are also further relaxed because of the common attitude of forward flexion in sitting, standing or walking, or they are passively extended by the equally common standing and walking attitude with hips forward. The longitudinal dorsal muscles generally have a considerable amount of labor to perform. It is true that professional men who habitually sit at their desks supporting the weight of their bodies by their arms, give the back muscles a minimum of activity; but on the other hand the majority of people who perform any kind of physical labor call upon their back muscles for

a large amount of work. The farmer may be considered typical in this regard. His work is mainly performed in a more or less stooping attitude which necessitates strong activity of the back muscles, but the activity is generally combined with extension, rarely with complete shortening. Similarly is the case with the muscles adducting the shoulder blades to the spinal column.

That function makes and modifies structure is only another way of asserting the adaptability of the body to the action of the environment. When a muscle is made to perform a certain amount of work, it accommodates itself to it. Its cross-section and strength increase until the limits set by constitutional conditions have been reached. If its activity again decreases, it undergoes an atrophy of disuse,—its cross section and strength diminish. But no less important, no less well known, though apparently very much less generally recognized in the practical work of the gymnast is its adaptability to the range of motion. Just as strength,—so far as it depends on the muscle itself—is essentially a matter of cross section, so the range of motion is dependent on the length of the contractile elements. Now, if a muscle habitually contracts to the limit set for it by the anatomical construction of the joint involved, the nutrition seems to become

distributed over the whole muscle belly. Its cross section increases and its strength grows; its length and range of motion remain normal. If, on the other hand, the contraction be limited in extent, Nature has no need of a muscle of that particular length. She gets rid of the superfluous length. An adaptation takes place, by which the muscle becomes able to contract over just the distance demanded of it, but no further. The muscle belly atrophies at the ends; parts of the contractile elements degenerate into connective tissue; the belly grows shorter, while the tendons lengthen at the expense of the former. Under these conditions the range of motion is impaired; nutrition may now be concentrated over a shorter distance, and a still further increase of cross section and strength, than under normal conditions, may take place. The muscle gains more in strength and loses in range by such incomplete contractions.

But these incomplete contractions affect not only the muscles themselves but changes occur also in the articulation itself and in the periarticular tissues. Those parts of the joint-surfaces which are not utilized in motion lose their smoothness. The capsule and ligaments shrink. We have all the phenomena of a pseudoanchylosis, because of which the joint not only cannot be actively moved to its

normal full limits, but there are mechanical obstacles even to passive motion.

We see these phenomena frequently as a result of pathological conditions. We see it very commonly in old age as a result of a limited degree of motion in which a person of old age habitually indulges. We see it in our laborer who, having grasped tools of various kinds for years, is unable to extend his fingers. We see it in our farmers, clerks, professional men and school children who, bent over their tasks for many hours each day, constantly employ the muscles on the front side of their thorax in incomplete contractions, with shortening, while their back and shoulder muscles are kept on the stretch, and who find when they endeavor to straighten up that it is impossible to do so. Make them try it, and they will bend backward in the lumbar region. Ask them to point with both hands straight up, and you will find the same backward tilt. Hang them by the hands, and the shoulder and hip joints will frequently be in front of the sternum. We find the same pseudoanchylosis in many of our athletes and gymnasts. Who is it among us who has not seen specialists on the horizontal bar or the rings unable to extend their elbows? Who has not seen many addicted to immoderate exercise on the parallel bars, who are

unable to assume even the semblance of an erect attitude?

Gymnastic movements, to prevent the development of these deformities, should then, as a rule, be to the full extent allowed by the joints, except that in such regions where the daily life tends to cause shortening, complete contractions should be avoided, while we should insist on complete relaxation and stretching; and that in such regions where stretching frequently takes place, we should emphasize complete contractions, and employ a good deal of static activity in order to secure the normal shortening, at the same time that we should avoid activity when the muscles are stretched.

Simple exercises effective in preventing, and correcting the abduction of the shoulder blades are movements of the upper arms in the plane of the shoulders or slightly behind it, such as placing the hands on the hips (Fig. 1), or behind the head (Fig. 3), bending the elbows while maintaining the upper arms immobile or rotated outward (Fig. 5), raising the upper arms sideways until horizontal, with elbows well retracted and strongly flexed, extension of the elbows from this posture, etc. (Fig. 7).

Errors of form are frequently committed in these simple preliminary exercises, which, apparently

small and easily overlooked by the untrained eye, should not be allowed to pass uncorrected by the teacher, because they are sufficient to defeat our purpose. Such are: in the first exercise, to bring the elbows too far backward, by which the glenoid portions of the scapulæ are rotated forward if the retractors of the scapula are not under extra good control (Fig. 2); in placing the hands behind the head, to bring the elbows in front of the shoulder-plane or to allow the head to be brought forward (Fig. 4); in arm-bending upward to allow the elbows to separate from the body, to bring the elbows backward, to place the hands on the chest (Fig. 6); in the arm-bending and stretching in the horizontal plane, to bring the elbows forward in the flexion, downward in the extension. (Fig. 8.)

The back muscles are strengthened and shortened by efforts to incline the body forward from the hips while maintaining it straight, by the maintenance of this inclined posture during movements of the arms, or by arching the body backward while lying prone with feet supported or unsupported, and the arms stationary in various positions or executing such movements as have already been mentioned. (Figs. 9-12.)

Later, when a fair degree of control has been

gained, arms should be extended above the head; and still later they might be brought forward.

In bringing the arms up above the head, parallelism of the arms should not be insisted upon if the arms cannot be kept in the shoulderplane. It is much more effective to insist upon the latter feature but to allow some degree of divergence upward.

To bring the arms forward when the retractors scapulæ are so weak, so elongated, or so little under control that the scapulæ glide forward unhampered on the thoracic wall during the motion of the arms, is detrimental to the best results. (Fig. 13.) So is also a trunkbending forward in which all the vertebral joints participate to the full extent. (Fig. 14.) These are exactly the kind of movements which are performed in daily life, which by their prevalence are the cause of the deformity, the prevention of which we should consider our duty. Bending forward in this manner and again stretching, strengthens the back muscles to be sure, but they keep them elongated, and, in spite of everything, the deformity develops. Those forms of exercises should be excluded.

In the exercises already mentioned we secure a strengthening of the back muscles and at the same time a more or less pronounced tension on the tis-

sues in front. Both of these desirable effects are emphasized by freestanding trunkbendings backward, with the arms in various positions. (Fig. 15.) In these there is a tendency to strive for considerable flexion with the result that practically all of it is localized in the lumbar region only, doing harm instead of good. This error is committed daily in hundreds of our gymnasia. The arching backward should be placed high up, with the arms brought well backward, and the lumbar region should participate only when the movement has been completed in the dorsal region as far as possible. That group of exercises which the Swedes call Tense-bendings are probably unsurpassed for the purpose now under consideration. The correct form with an even arch and thoroughly extended arms requires strong static activity in the shoulder region and the ribs spread out fanlike in front in the most beautiful manner. (Fig. 16.)

It should be noticed that all the examples hitherto given are selected because they place the body in the necessary posture by means of active muscular contraction. Any exercise which does this is of undoubted value.

When looking for suitable means to counteract influences which tend to bring on shortening of tissues, or which may have brought on such a condi-



FIG. 9.

“The back muscles are strengthened and shortened by efforts to incline the body forward from the hips.” (*See page 36.*)



FIG. 10.

Maintaining the arms upward intensifies the action indicated under Fig. 9. (*See page 36.*)

tion, our minds turn quite naturally to means by which a more or less powerful extension of the shortened tissues may be brought about. The orthopedic surgeons relied for many years nearly exclusively on passive extension, supplied by braces, plaster of Paris casts, leather corsets, etc., to conquer such deformities as round shoulders and rotary lateral curvature of the spine. The method was futile, and has now gone out of use except in very exceptional cases, and active gymnastic treatment has been largely substituted. It is not too much to say that considerable credit for this change is due to gymnasts. And still we observe procedures used in our gymnasia as preventative means which exactly correspond to those discarded by the surgeons. One example is the lying on the quarter circle. This is supposed by many to be effective in preventing or even curing round shoulders. But this is a mere delusion. The anterior tissues are certainly relaxed by the posture on the apparatus, and if maintained so for several hours daily there is no doubt about its efficacy in preventing the development of the deformity. But the gymnasium should not be the place where passivity should be encouraged, and passivity of sufficient duration in that posture would become torture. The gymnasium is the place for activity. Therefore the

quarter circle is supplemented with an overhead pulley weight. This changes the apparatus from one of absolute uselessness into one whose good or evil effects depend on its use. If the arms, as is very commonly, if not generally, the case, are brought down in front of the body, it is the pectoral group which nearly exclusively enters into activity and we are by the exercise fortifying the evil effects of the predominant pectoral contraction of daily life. It then becomes a deforming influence. The arms may be so carried—well to the sides—that some real benefit may accrue, but this benefit can more easily be gained by other means and without any special apparatus being necessary. The quarter circle may be exiled from the gymnasium without loss. That it still retains its place notwithstanding its very limited usefulness would be inexplicable, were it not for our usual disinclination from breaking with the common routine.

Numerous exercises are practised in the gymnasium which have exactly the contrary effect from that which is expected from them because of their mere external form. The so-called “Hammock hang” is an example of these. (Fig. 17.) The body with face downward is suspended by means of hands and feet. The arms are thus brought to extreme abduction backwards carrying the

shoulders with them, while the spine is curved backward. Many expect that by such a posture round shoulders may be prevented or cured. But note that the abductory force here is not the retractors of the shoulder blades, or any muscular contraction whatsoever, but the posture is brought about solely by the action of gravity. The supposed correction of spine and shoulders is therefore the result of the same force as in lying on the quarter circle. But here we have, besides, a strong contraction of the pectorals and anterior portion of the deltoids, necessary in order to save the shoulder joints from dislocation. This hanging exercise acts on the shoulder girdle exactly as an orthopedic brace—the muscles of the back which need strengthening are placed in inactivity, while the anterior tissues, exercised to oppose the strain, will develop in strength, and consequently when released will be still stronger than before to pull the shoulders forward. The same is true of the so-called “rear hang” (Fig. 18), the “rear bent arm rest” (Fig. 19), circling from this posture, and others, which by the pectoral activity are deforming the chest instead of improving its form. And we need not turn for examples of this nature to these comparatively severer forms. We may think of the exercises in which the wand is brought back of the

shoulders or behind the hips, and allowed to rest there acting as a brace to overcome which the pectorals contract. (Fig. 20.) We may call to mind that exercise in which two pupils face each other and holding each the ends of two long bars either above their heads or down at the sides, endeavor to force the opponent back, while the latter strongly resists by pectoral contraction. (Fig. 21.) Or we may think of how often we observe classes in which the pupils are made to place their hands behind their heads and then endeavor to bend the neck backward against the resistance of the pectorals. Examples of this nature can easily be multiplied.

While such exercises as those hitherto mentioned are definitely injurious because of their very nature, there are a number of others which may be innocuous, beneficial, or injurious according to the manner of execution, apparently small variations in form totally reversing the effect. These variations are frequently so small that the untrained eye fails to detect them, and many of our gymnastic teachers need to have their attention specially called to them. A fair example of these is "the dip," which enters as one of the usually prescribed feats in strength tests. If the flexion of the arms be done to moderate degree with the elbows moving in the shoulder plane, we get a simultaneous strong

contraction in the pectorals, the latissimi and the retractors of the scapulæ, which is beneficial in causing chest-expansion and educating to a correct attitude. But if the arms be flexed to the extreme extent, usually encouraged in the strength tests, or if the elbows are brought considerably behind the shoulders as we frequently see it done, the posterior muscles relax, the weight of the body causes an extreme abduction of the arms, which is resisted by the pectorals, and we have an exercise developing the strength of the latter but at the same time compressing the chest. In the same category we may put all the other exercises which by the Swedes have received the generic name *heave movements*. Take the simplest of the more typical group in this family, the mere hanging by the hands. If the weight be passively suspended from the arms (Fig. 22) we get the passive extension which we have already spoken of as having practically a negligible value. If, on the other hand, all the muscles joining the trunk with the shoulder girdle and arms be contracted so that the body is lifted between the latter, we secure a judiciously distributed activity which is of the utmost value. (Fig. 23.) If now an arm bending be added the effect becomes still more pronounced, but its desirability is conditioned on the form maintained. If the elbows be carried

in the shoulder plane there results a chest expansion and flattening of the shoulders of greatest value. (Fig. 24.) If the arms are allowed to move forward, as is usually done in "chinning," there follows chest depression, rounding of the back, and abduction of the shoulder-blades. (Fig. 25.) So executed, the exercise has no developmental value, but is causing direct injury. It is a mere "stunt." It is an exercise which may be defended by those who, in gymnastics, see the road towards creating desire for activity without taking account of the directly beneficial effect of this activity on the formation of the body; but to those who believe that general educative influence should be gained by play and games, while the gymnastics shall have more specific effects, the exercise becomes an evil, and they should exclude it from their *materia gymnastica*. As the complete abduction of the elbows becomes very difficult with supinated hands if a rigid apparatus like a horizontal bar or boom be used, the exercise on these apparatus should preferably be done with pronated hands, while some yielding apparatus, like vertical ropes or rings, permitting the body to advance between them, should be chosen if we wish to "chin" with supinated hands. The same demands on a proper cooperation between all the muscles of the shoulder girdle should

be observed in all the heave movements. For instance, in fall hanging posture, and in arm-bending in that posture, the body should not be permitted to sink down while the shoulder blades advance upon the thorax, and the elbows should not be permitted to be brought forward (Figs. 26-27). For the same reason, we should exclude arm traveling forward, at least on a narrow apparatus like the boom, while flexion of the hips forward from a hanging posture should not be permitted without a firm support behind the sacrum. Without this support, the body, because of the advance of the center of gravity, will swing backward causing a chest depression.

These examples of selection as to form must suffice. But of no less importance is the question as to intensity and speed.

In the selection of proper form, we have been obliged to consider not only the interaction of gravity and the motor muscles, but also the activity of all those muscular groups which serve to give proper direction and smoothness to the motion, and to those which furnish fixed points. We are generally perhaps too prone to consider a motion as the result of a contraction in a single isolated group. As a matter of fact, however, every natural movement involves the cooperation of a large number

of muscles: motor, directors, fixators, which, in their cooperation, essentially determine the form; and the antagonists, the proper participation of which is determined greatly by the intensity and the speed of the contraction in the motor muscles.

If a movement be done slowly, the antagonists participate less and less the greater the energy of the contraction in the motor-muscles. Thus if we slowly flex the elbow, the extensors contract with a force nearly equal to that of the flexors. But if we hold a heavy weight in the hand during the flexion, that weight serves to control the motion and the extensors are not needed. They relax completely. If now the speed be greatly increased the flexor muscles must of course at the beginning exert a greater force to set in motion the weight, while the extensors remain in inactivity. But when the motion has been well initiated, it is continued by its own momentum; the flexors may, and do, relax during the latter part of the motion. As the motion approaches its natural limit, the momentum must be gradually overcome before it be checked by the construction of the joint. During the last part of the movement the extensors, therefore, involuntarily enter into a more or less violent contraction, serving as buffers, without which traumatism may occur. Such traumatisms are not



FIG. 11.

The back muscles are strengthened and shortened by arching the body backward while lying prone.
(See page 36.)



FIG. 12.

Maintaining the arms upward intensifies the action indicated under Fig. 11. (See page 36.)

quite unknown in the field of physical training. The pitcher's shoulder frequently suffers from a traumatic arthritis, because he trains himself not to check the forward motion of the arm, in order that the greatest possible speed may be given to the ball.

But excessive speed or energy are not necessary to cause this antagonistic resistance. If we mentally prepare ourselves to reverse the motion immediately it has been completed, the mental attitude finds expression in an unconscious contraction of the antagonists long before the first phase of the movement is completed. Thus, in oscillatory movements, so commonly used in our gymnastics, and seemingly at present urged more earnestly by our psychologists than ever before, we find this taking place. In a consecutive series of flexions and extensions, the flexors contract during the last half of the extension and during the first half of the flexion, but are relaxed during the last half of the flexion and the first half of the extension, and during their relaxation extensor activity is substituted.

From these facts it may perhaps be permissible to draw some conclusions.

It has been a time-honored custom to increase the muscular contraction by the use of external weights. For a long time heavy dumb bells were lifted and

tossed in our gymnasias. That time has passed, and they are now relegated to the training quarters of professional strong men. May they remain there, until they finally land in the junk-shops. The discredit into which they have fallen was probably due mainly to the interference of sustained efforts with proper respiration and circulation. The portable apparatus now in use, dumb bells, Indian clubs, wands, barbells, hoops, and so forth, are not employed, primarily at least, for the purpose of furnishing an increased resistance, though many voices praise them on that ground. They are supposed to be chiefly beneficial in adding a psychic element lacking in free exercises. It is considered that it is easier to maintain interest when the pupil has external objects to deal with than when he moves his own body, and that the slightly increased resistance furnishes clearer perceptions as to space relations. There seems to be something for the latter argument. The former, however, can but be fallacious. Poor indeed is the teacher who needs definite externalia to supplement the influence of his own personality. But, however that may be, it does not concern us in this connection. Here we shall confine ourselves to consider these apparatus as weights. Even if we acknowledge the great improvement which has come with the substitution of

light weights for heavy ones, we must still consider that an addition of half a pound to a pound in the hands of a small child is not without its influence. And when we know how severe a task it may be for a child in the second or third year of school to contract sufficiently to move the unweighted arms, in such paths as we may reasonably demand, we must deplore that many of even our best manuals recommend these extra weights. If the argument for them because of a greater ease of perception formation holds good, the problem still remains unsolved whether the benefits in this regard are not more than counterbalanced by the nervous and muscular strain brought about.

It may now be remarked that this strain is not so great as may appear, because the exercises with these apparatus as usually performed are only momentary contractions, the different phases of the movements not being separated by distinct pauses but imperceptibly melting one into the other, and that we consequently deal with the kind of oscillatory activity in which the antagonistic muscles alternate quite rapidly, giving sufficient time for recovery. But this is just the strongest argument which can be made against the usual exercises with portable apparatus. Just because of the rapidity with which the movements follow each other, they

rarely induce complete contractions, and are therefore not the proper means by which the nutrition can be distributed over the whole muscle, but are conducive to short and bulky muscles. To get the best results from exercises with external weights, in fact to get any good results at all, the movements must be done only with moderate speed—less speed than corresponding free movements,—and the end of each phase of the exercise must be well marked.

If the adding of the small weight of the present dumb bells should be well considered before they be employed in the exercises of small children, this reason does, of course, not affect their use by adolescents and adults. To them half a pound weight is of less importance, and if we wish to use them, we need only avoid adding unduly to their weight and observe the rule as to the necessity of completing each phase of an exercise before another is allowed to begin.

For the more mature ages, every “well-equipped” gymnasium has a large number of pulley weights. The matter of what apparatus to use is a question of very, very small importance. The salient point is the manner of its use. There are no qualities inherent in an apparatus which can justify us in commending or condemning it. It is only a question of convenience and adaptability. If anybody

has a special predilection for a given apparatus, he certainly should utilize it, whatever others may think of its value. The manner in which he uses it is of the utmost importance. But what benefit can anybody get out of pulley weights? There is no desirable form of movement that we can give with the help of them that we cannot give more conveniently and as energetically with other apparatus or without any apparatus whatsoever. They are supposed to be very valuable in helping to localize the contraction. Their efficacy in this regard is certainly very much exaggerated. And every one must admit that the usual manner in which they are employed is provocative of more harm than good. To gain benefit from them a good attitude should be maintained. Generally speaking, more attention is now paid to that side of the question, so that criticism of errors committed is more or less out of place. But the same requirements as to completeness of contraction, the pause at the end of one phase of the movement, and moderation of speed, are necessary with this apparatus as with dumb bells, and in this matter no noticeable change has been made during, let us say, the last fifteen years.

To recapitulate: The selection of exercises concerned with the form of the back and shoulder re-

gion must be such that the dorsal muscles and the retractors of the scapulæ become strengthened and shortened, while the tissues in front of the chest become elongated.

By these means we train the system so that good form may be retained unconsciously during our common activity. A person well-trained in gymnastics of this kind will, for instance, assume a writing posture like Fig. 28, instead of that in Fig. 29.

We thereby cause a permanent enlargement of the thoracic cage. This effect should be further emphasized by exercises causing mechanical elevation of the ribs, such as raising of the arms and suspensions from the hands (always with straight back and well-retracted shoulders), and by voluntary respirations. Exercises in running are also excellent for enlargement of the thorax, due care of course being given to the duration and frequency. The adolescent of course can sustain a much greater effort in this regard than the child or the middle-aged man. And everybody of whatever age gains the greatest chest expansion by judiciously employing both running and so-called respiratory exercises.

A proper carriage of the upper part of the body immediately changes the contour of the abdomen,

which we have already said is the second part needing our special attention.

The enlargement of the chest causes the ascent of the abdominal viscera by an increase in the thoracic aspiration, and, the ribs being lifted, the abdominal wall itself is made to serve in its natural rôle as a support for the viscera. But it needs also strengthening. Without it the lumbar curve is apt to become enlarged. Exercises involving the contraction of the abdominal walls must therefore be selected, and the same care should be given to their proper execution as to those of the back and shoulders. There are several types of exercises which may properly be utilized for this purpose. The chief danger to be avoided by a proper selection lies in the possibility of depression of the chest and curving forward of the spine by these exercises. To avoid this, we may choose such a posture as will passively maintain the ribs elevated and the body straight, as for instance hanging the pupils by the hands during a flexion of the legs upward, or during the execution of various movements of the legs while they are flexed upon the trunk. (Fig. 30.) In speaking of these movements with regard to their effects on the thorax, we have already pointed out the difference as to the chest

when the sacrum is supported and when the body hangs free.

Another and more important means to obviate the possibility of chest depression is the active maintenance of a straight back and retracted shoulders during the abdominal activity. If now it be the intention to affect the abdominal muscles by a flexion of the trunk upon the legs from a lying posture, it is evident that the preponderance in weight of the trunk over the legs will make the movement executed with a straight back impossible if the legs be not firmly supported. If this precaution has not been taken, the contraction of the flexors of the hips will raise the legs as being the most movable segment, or the body will be curled up forward. (Fig. 31.) Exercises in sitting with supported feet and the body inclined backward are to be recommended. True trunk-bendings backward strengthen the abdominal wall and the arch in the upper back prevents rib depression. But if carried to extreme, the lumbar curve will be exaggerated and the abdominal wall will be lengthened. These extreme bendings should therefore only be used comparatively little. Exercises in such a posture that the prone body rests upon the hands and feet are often done in such a manner that the body is allowed to sink down, the lumbar



FIG. 13.

Abduction of the shoulder blades commonly seen in exercises involving the "reach" position. (*See page 37.*)

curve becomes exaggerated and the abdominal muscles elongated. (Fig. 32.) A sufficient abdominal contraction easily corrects this error of form. (Fig. 33.) Among these exercises may well be classified bending and inclining the body sideways, and twisting. At the same time that they strengthen the abdomen, they are most important in maintaining and increasing the mobility of the thorax. The trunk twistings, to accomplish their purpose, must be done with fixed pelvis. Generally they are erroneously done in such a manner that the pelvis and lower extremities partake in the twisting, the abdomen and thorax receiving very small benefit.

The application of exercises selected with special reference to the effects upon the carriage and the abdominal wall should constitute the main part of the gymnastic lesson, if the object be, as we have maintained, the specific hygienic one of securing to the organs of nutrition the most favorable conditions for maintaining the health. To these should be added numerous exercises of applications both for the purpose of adding that large amount of physical activity without which vigor cannot be maintained, and to educate the pupils in economical modes of energy-expenditure.

The selection of which we have spoken has dealt

with the form, speed and energy of relatively simple movements. These are the elements of which composite exercises should be built, and in the latter there should enter no elements but the former, except, if I so might express myself, as the material binding the elements together. Thus we have, for instance, emphasized the necessity of avoiding chest depressors. It does not matter how composite, complex or difficult an exercise may be, we must still consider it to be a fundamental condition that it shall not cause a chest depression. But this should, of course, not prevent the use of an exercise which, upon the whole, is to be recommended, but which requires as a transient phase such a depression. Transient intermediate depression has no evil effect, if it be not too frequently repeated. What is most important is the beginning and the end of each phase, those parts which we have said should be marked by a definite pause, even if small, and which gives to the movement its finish and gymnastic character.

CHAPTER III

THE PRINCIPLE OF GYMNASTIC TOTALITY

THE principle of suitable selection is of prime importance to the gymnast. An immense number of possible movements, either because of their direct injuriousness or because of the lack of direct usefulness, must be weeded out. But there still remains an immense material in which order must be brought if we shall ever hope to gain control of it. We must undertake to bring together those exercises which resemble each other in all main features, separating them from others with which they have little in common. No science is possible without classification of the material with which it deals. No science of gymnastics can ever grow up if we do not endeavor to classify the exercises. It being well understood that the exercises themselves are not the end, but the effects they produce, it immediately becomes evident that the only satisfactory basis for such a classification is to be sought in these effects. A classification based on mere external form, or upon the apparatus used, or on any other incidental similarity or dissimilarity can have

but small value to him who wishes to study his subject. To him the effects are the important matter, and by such a classification forms are brought together which vary greatly in their effects. So, though we may loosely speak of free exercises and apparatus work, of head movements, and leg movements, of wand exercises and dumb bell exercises, of parallel bar exercises, of exercises on the horse, we must remember that this is not a classification into natural families. A perfectly proper classification on the other hand is one sometimes used, by which exercises are divided into exercises for strength, for coordination, for speed, for endurance, for attention, etc. It has the great advantage also of denoting, by the very name given to the groups, the desired effects, a condition which is of no mean value. But it does not satisfy our needs, if we consider the chief aim of gymnastics, the main effects sought, to be the influences on the organs of nutrition. A group of exercises for strength can not be admitted by him who looks upon the acquirement of muscular strength by gymnastic exercises as a mere incident, and to whom increased muscular strength in its highest degree is an evil, rather than a benefit. "Exercises for coordination" can hardly be admitted even though coordination is a benefit well worth striving for, because such admittance

opens the way to that endless coordination for which de Paspee made himself an advocate, and the teacher will find the utmost difficulty in finding his way among the rocks of "all possibility," if it be not clearly indicated that the coordination that he is required to develop is only the coordination into simple basic exercises, while the power of more complex coordination shall be supplied in the applications in the gymnasium, on the play ground and in daily life. So all through the list.

The classification that we need for guidance in our labor for the all rounded development of the individual, in which his health plays the chief part, must be founded upon the effects that the exercise have upon the vital organs and their functions. An ideal classification would be one which grouped together in indissoluble union such exercises which affected a given function in definite manner. We have not yet reached that stage of knowledge, and it is possible that we never may reach it. In the meantime a classification which fulfills quite far reaching demands in this direction, has been essayed by the Swedes. They have brought together at all events the chief exercises, to which no objections can be raised, into natural families, each of which differs from the others in their main effects, while all exercises belonging to a given family have

the main effects in common, though they vary in minor details. Whether apparatus be used for an exercise or not is not considered in the classification. In the same group may well be brought an exercise without apparatus, an exercise on horizontal bar, on the parallel bars, on the boom, on the ladderwall, on rings, provided they all affect some definite function or functions in essentially the same manner. There seems no doubt that the classification to be generally accepted in the future must be on such a basis. The classification still common in this country into "light" and "heavy" gymnastics, into "dumb bell exercises" and "Exercises on the bar," "on the long horse," "on the side horse" has no value whatever from a scientific view point though it may be a matter of convenience to him who devotes himself to gymnastics as a mere art.

One objection has been raised against the classification by the Swedes, concerning not the kernel but the mere shell. The names chosen for the "natural families" are not such that by them we are immediately led to the thought of the effects. If you have no knowledge before hand of the underlying basis, no very vivid idea of the desired effects is conveyed to you by such terms as "tense bendings," "heave-movements," etc. When we hear somebody speak of an "Exercise for strength,"



FIG. 14.

"Trunk bending forward in which all of the vertebral joints participate is detrimental to the best results." (*Compare with Fig. 10.*)

we immediately know his aim. But after all, if the grouping is definite and based upon a correct conception, the mere names matter little. They are made for students not for outsiders. And in all sciences terms are used which to the outsiders convey no idea. Nobody but those who have studied chemistry, at least superficially, can understand that H_2O stands for water, nor does anybody but an electrician know what is meant by "Ohm," "Volt," and "Ampere."

Provided now that we have classified our material according to its effects upon the organism, and provided further that we strive for an all round development, it follows that no one of these natural families ought to be practised to the exclusion of others, but that by a judicious choice from the various families we shall endeavor to influence all organs and all functions to the degree of their needs. We shall keep in mind that harmony between the functions is our goal, that all sides of human nature must be influenced by us, that general efficiency is what we strive for, not extreme ability in one direction.

In the application of this principle, the Swedes demand that each lesson shall contain as great a variety of exercises as is possible, and in order to make the all sidedness complete, they make each

lesson contain at least one representative of each natural family, if insurmountable obstacles do not prevent.

Every lesson should, if possible, be directed to improvement in all the desired directions. Each lesson must consist of as rich material as we possibly can give. We shall not consider it sufficient to devote our attention to the shoulder-girdle to-day, to the abdomen to-morrow. But the whole man must be considered in each lesson. The pupil must in each lesson be influenced to the better in all the different ways that we can. Each lesson should give a sample of all that we can offer by gymnastics. The samples must vary from day to day, but the main types must recur in every lesson.

This demand of allsidedness in each lesson is made by no other system. Is it advantageous or not? The answer can only be given upon the basis of experience. The adherents of that system claim good results. Their claims are supported by many students. A friend of mine representing a different system claims that there is an absolute necessity for bringing into a lesson a large number of exercises, essentially alike, differing only in small details, in order that thereby the proper coordination may be speedily acquired. He claims that the

Swedish gymnasts never learn to do more than a few exercises, simply because they flit from one kind to another in each lesson. We shall not deal with that question here. Controversies of that nature never come to any result. "A man convinced against his will retains the same opinion still." Be it sufficient to ask the question if the lesson has for its purpose to teach gymnastic exercises? Is it your object to create gymnasts? In other words—are the gymnastic exercises, and the skill displayed in them, the ultimate end for which you work? If it is, then choose the methods giving the greatest ability in the shortest time, whatever that may be. If it is not, then it matters little whether a large number of exercises have been learnt or not, if you only have accomplished your object. Let us look at a typical lesson from some authoritative work. Here is one with Wands.

- I. 1. (Straight arms) In front forward.
2. Left in front over.
3. (Straight arms) In front forward.
4. Down. 4 counts
- II. 1. (Straight arms) In front forward.
2. Right in front over.
3. (Straight arms) In front forward.
4. Down. 4 counts
- III. 1. (Straight arms) In front forward.

2. Left in front over, right downward.
 3. (Straight arms) In front forward.
 4. Down. 4 counts
- IV. 1. (Straight arms) In front forward.
2. Right in front over, left down.
 3. (Straight arms) In front forward.
 4. Down. 4 counts
- V. 1. (Straight arms) In front forward.
2. Left in front over, on right shoulder.
 3. (Straight arms) In front forward.
 4. Down. 4 counts
- VI. 1. (Straight arms) In front forward.
2. Right in front over, on the left shoulder.
 3. (Straight arms) In front forward.
 4. Down. 4 counts
- VII. 1. (Straight arms) In front forward.
2. Left in front over and right in front over.
 3. (Straight arms) In front forward.
 4. Down. 4 counts
- VIII. 1. (Straight arms) In front forward.
2. Left in front over, right upward.
 3. (Straight arms) In front forward.
 4. Down. 4 counts
- IX. 1. (Straight arms) In front forward.
2. Right in front over, left upward.
 3. (Straight arms) In front forward.
 4. Down. 4 counts

- X. 1. (Straight arms) In front forward.
2. Left in front (Middle of the chest),
right downward.
3. (Straight arms) In front forward.
4. Down. 4 counts
- XI. 1. (Straight arms) In front forward.
2. Right in front (Middle of the chest),
Left downward.
3. (Straight arms) In front forward.
4. Down. 4 counts
- XII. 1. (Straight arms) In front forward.
2. Left in front (Middle of the chest)
right upward.
3. (Straight arms) In front forward.
4. Down. 4 counts
- XIII. 1. (Straight arms) In front forward.
2. Right in front (middle of the chest)
left upward.
3. (Straight arms) In front forward.
4. Down. 4 counts
- XIV. 1. (Straight arms) In front forward.
2. Left upward, right downward. (The
arms remain extended).
3. (Straight arms) In front forward.
4. Down. 4 counts
- XV. 1. (Straight arms) In front forward.
2. Right upward, left downward.
3. (Straight arms) In front forward.
4. Down. 4 counts

XVI and XVII. Same as XIV and XV, with both arms bent in vertical position in front in the second count.

This is a comparatively simple program, in fact it is supposed to be the seventh lesson. But it consists of seventeen exercises each of four counts, or a total of sixty-eight movements of the shoulders without any intermediate action of legs or trunk. With the repetitions necessary to secure an execution satisfactory to the teacher, it is probably well within the limits of probability that the actual number of movements performed rather exceed than fall below two hundred. That all these movements are in front of the body, of the same general nature as those performed in daily life and as such represent onesided activity without corrective influence does not here concern us. That is a matter of selection. The question you shall answer each to himself is this: Is it to the best interests of the organism that this comparatively large number of movements of the same part of the body shall be made without intervening rest or activity of other parts?

Let us look upon one more lesson from the same authoritative work, this time choosing the first lesson on the horizontal bar.

Stand directly under the bar; the bar and a line drawn through the shoulders run parallel. Jump into

1. Handhang; overhold, jump off. Repeat several times.
2. As exercise 1 with underhold; also 1 and 2 alternately.
3. As exercise 1, with twist underhold.
4. Stand as before at the left end of the bar; jump to overhang; overhold; travel sideways right by moving the right hand four or five inches sideways, following with the left. Jump off.
5. The same opposite.
6. As exercise 4 and 5 with underhold; also with twist underhold.
7. As exercise 4 and 5 in a bent arm hang with underhold; also with overhold.
8. As exercise 4, moving both hands simultaneously, bending the arms slightly immediately before the change.
9. As exercise 8 with underhold also in bent arm hang.
10. A handhang; overhold; change the right hand to underhold; also left hand; repeat several times; jump off.
11. As exercise 10, changing both hands immediately to underhold; bending the arms just before the change.
12. A handhang; overhold; raise the right knee forward and lower in two counts; the same left.
13. As exercise 12, alternately in four counts.
14. As exercise 12, raising both knees and lower.

15. As exercise 12, 13 and 14, in a bentarm hang, with overhold or underhold, raising the straight legs forward.
16. Bend and straighten the arms as often as possible, first with underhold, then with overhold.
17. At the right end of the bar handhang; overhold; travel left sideways with a half turn left and right alternately. The right shoulder moves forward; the right hand takes overhold on the opposite side of the bar; the left retains underhold; then the same left forward.
18. At the right end of the bar under hang; travel left sideways with a half turn backward; continue changing from underhold to overhold alternately.

This plan for a lesson gives opportunity for study in many directions. We might well consider, for instance, whether the selection of the "twistunderhold" is a suitable one (Exercises 3 and 6), or the raising of the straight legs forward without support for the body, or the traveling sideways with turning forward. We might question the succession of the movements, and we may first and foremost ask for what kind of pupils is this first lesson intended. Is it for children just beginning? If so, what form can be expected from them in such exercises as 15 or 16? If it is intended for mature



FIG. 15.

“Pronounced tension of the tissues in front with shortening of the back muscles.” (*Compare with Fig. 34.*)

gymnasts, then we may well ask whether any special practice is needed in such exercises as 1, 2, 4 or 5. But these are questions which do not concern us at present. We are now more interested in the fact that nominally 18, but in reality a still greater number of exercises, are used in succession, in all of which the body is suspended from the hands. Is this wise? Is this an example of the much vaunted variety? Is not this a procedure by which some parts must necessarily be slighted, while the active ones become exhausted?

Because, though the shoulder-girdle may well be used for hanging exercises, though we have maintained that the gymnastic lesson shall act as a counterbalance to the one-sided activity and shall contain exercises of a different nature to those used in daily life, we do not thereby mean that the normal functions shall be reversed. The shoulders may well be used for moderate exercises in handling, but to make a whole lesson of these exercises is certainly not consonant with common sense. The remark may be made that this program is not intended as a full lesson. That other exercises are to be practised. I suppose that to be true. But 18 (or more) exercises practised with even such a small class as a dozen, and repeated a sufficient number

of times, occupies a considerable part of the lesson, and there will only be small time left for other important forms.¹

Those who build their lessons in this manner are of course fully alive to the greater benefit of, let us say, daily lessons of half an hour each, than of one weekly lesson of three hours, but they do not apparently agree with us that what is true of the body as a whole is equally true of each part. That just as the gymnastic work, to be most highly beneficial cannot be concentrated upon one lesson a week, so each part derives most benefit if it is called into activity every day rather than at long intervals even though the total amount be the same.

This demand of the Swedes that, so far as circumstances will allow, all important families shall be represented in each day's work, that no important organ or function shall be overlooked or slighted, but that all shall receive attention corresponding to their importance and needs; that single

¹ Since writing the foregoing, my attention was called to an error committed by me, in as much as this so called "lesson" never was intended to be used as a lesson, but only to exemplify the development of a "theme." I earnestly regret this mistake on my part, which however is explicable enough. But the fact criticized is not changed. Any one may see in practical use daily actual lessons, which in no essentials differ from this developed theme, and which certainly do not recognize the principle of totality as seen by the Swedes.

parts or organs shall not be put to extreme activity while others suffer from inactivity; that the training given in each lesson shall not be onesided, but shall affect the whole body, the whole organism, the whole man, has been called the principle of gymnastic totality.

Circumstances may of course be such that there is absolute impossibility of adhering strictly to this demand. The time given for gymnastics may, for instance, be totally inadequate. Nobody would be able to present even one representative of each important family to his class during the ten minutes granted by some school authorities for "Exercises in the Class Room." Under such conditions we must, of course, resort to makeshifts, but, then, the whole procedure is a makeshift and must be judged accordingly. The principle is not violated by necessary changes in its applications, though we should not forget it but always keep it before our minds so that we depart from it only so far as we are absolutely obliged to do. Some methods by which we may keep as close to the principle as possible even when we cannot apply it in all details, will be mentioned later.

CHAPTER IV

THE PRINCIPLE OF GYMNASTIC UNITY

GRANTED now that the principles of *selection* and *totality* be accepted, granted in other words that we must carefully choose our exercises, and, after classifying them into natural families according to their effects, apply a great variety of them in each lesson, we may well ask the question whether the representatives of the different families may be utilized in the day's lesson at haphazard, or whether it may not be possible to gain better results by following some definite sequence. This question forces itself upon us by observation in other fields. Darwin pointed out that every animal before a supreme effort instinctively makes numerous movements, which seem to serve the purpose of putting it in a favorable condition totally apart from the mere mechanical advantage of suitable posture. The bull prepares for the attack by pawing the ground, and by brandishing his horns and by bellowing. The cat lashes his sides with his tail before springing on his prey. Even man

stretches when rising in the morning, and if he becomes embroiled in a quarrel which may end in a fight, he shows a tendency to make movements with arms and legs which apparently serve no purpose. There seems to be some need to be filled by gesticulation of some kind. And we have more or less unconsciously, perhaps, made application to this in various ways. The race horse is put through a preliminary canter before he is called upon to exert himself in the race. The baseball players always take their preliminary practice, before the game begins. They are warming up. It is a usual experience that a man who wishes to test his strength by the dynamometer shows greater power on a second trial than on the first one. Physiologists have established by laboratory experiments that the first muscular contraction in a series is not quite so strong or complete as those immediately succeeding, but that there is a preliminary rise in the curve before it descends as a result of fatigue. It is now quite common in the gymnasium to begin with some "warming up" exercises, before work of greater intensity is begun. The general usefulness of some form of introductory exercises is well established and we may well assert without fear of serious contradiction that the day's lesson must begin with mild exercises. It is not necessary to cite the prob-

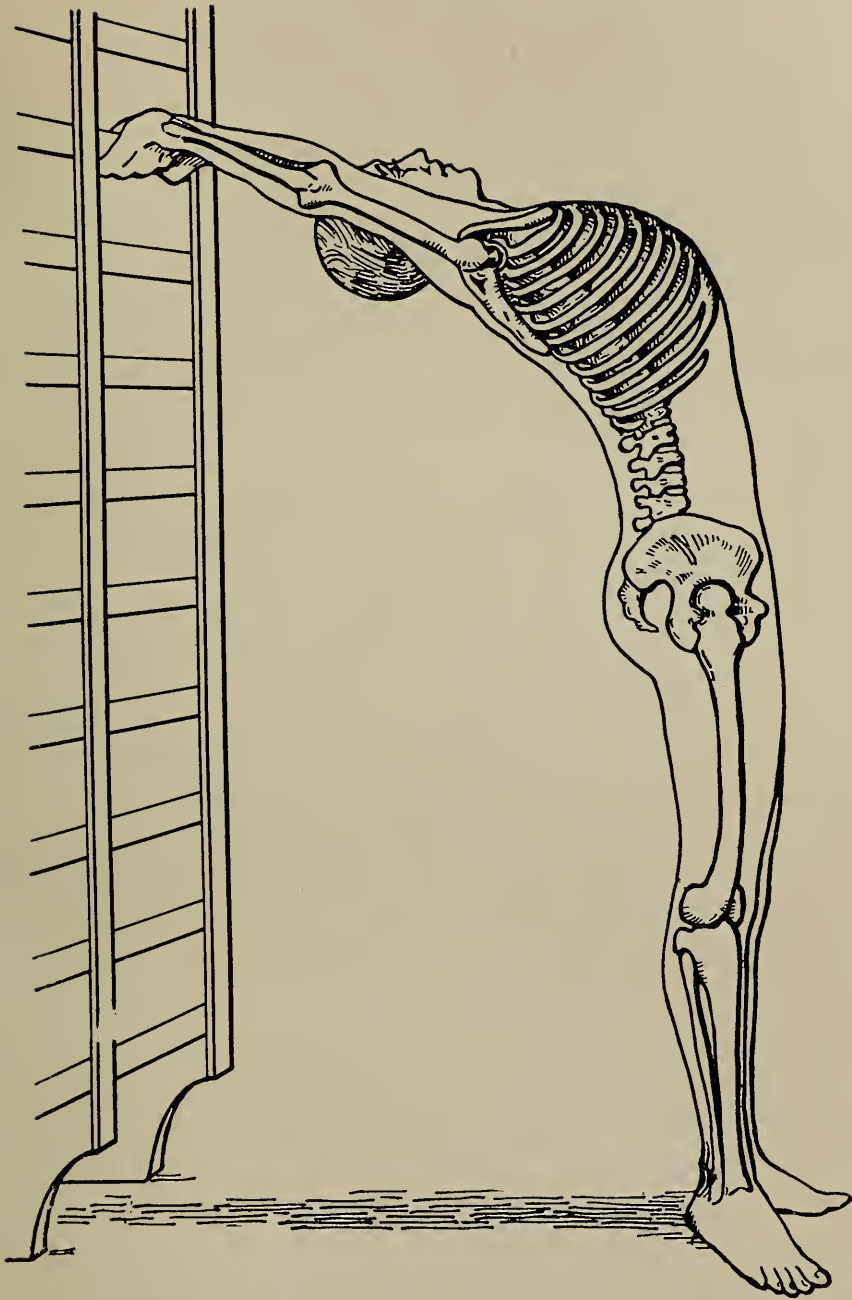


FIG. 16.

A "tense bending" secures static activity in the shoulder region, and the ribs spread out fanlike in front. (*See page 38.*)

able physiological reasons for this, but simply to refer to experience.

On the other hand, it is practically and equally well established that if violent and prolonged efforts are made to the very limit of the individual's powers, a sudden cessation of the activity is less favorable than a gradual decrease. From the pathological field experiences in this regard may be quoted. Suppose, for instance, that a person with an organic heart trouble makes strong and consecutive efforts. Records are not rare of men with cardiac affections falling dead while in the very act of lifting a heavy weight. But it is surely not so common that a man has met his fate while running. It is when he has reached his goal, when he has taken his seat, when the activity has ceased, that the weakened heart fails to respond to the calls upon it. I know of no authoritative physiological explanation of this, so I have endeavored to theorize for my own satisfaction and my ideas run about as follows: The circulation is carried on mainly by three agencies, the heart, the respiration, and the muscular encroachments upon veins and lymphatics. During the run all of these three agencies are at work to their utmost capacity. With the sudden cessation of activity the last one is withdrawn and a greater amount of work therefore falls

upon the others, because the circulation is not immediately restored to its normal rate. The heart was assumed to be worked to its utmost. It now gets more to do, and it fails. If instead the muscles are kept working with a descending intensity they continue their pumping effects, and the heart gradually adjusts itself until the danger-point is passed.

But we do not deal with pathological conditions. We have normal individuals to deal with and should draw our experience from such. If we again turn to the race track, we find that experience has taught the jockey not to stop as he has passed the finishing line but to walk his racer about at least for a few minutes "to cool off." Many a careful trainer does not allow the athlete who comes in exhausted from a long run to follow his inclinations and flop down on the field as he crosses the line, but, with a sweater thrown over him, he is made to walk up and down even against his will, dragged along, maybe, by some friend, until he has recovered to some extent. Now, in the gymnasium, we do not, and should not, drive our students to the point of collapse. But it is our business to have them make strong efforts and both respiratory and cardiac actions may thereby, to a certain extent, be embarrassed, while the heat of the body is increased. If

after these efforts, intellectual labor shall be resumed in sitting posture, may it not be well to take the precaution of letting the system gradually quiet down and cool off, whereby is also gained the advantage of bringing the pupils into fit condition to resume their studies immediately with the best results? Because nobody just in from severe physical activity can do his best mental work. Some minutes must elapse before the system has readjusted itself to the changed conditions.

Our conclusions are therefore that just as we should not begin our work with exercises requiring the strongest efforts, neither should we let these come at the very end of the lesson, but they should be followed by some forms of milder intensity suitable to allow the heart and lungs to approach their normal degree of activity, and to allow the surface temperature to decrease.

This procedure seems in principle to be accepted by a very large number of Physical Directors. And still they plan their lessons in such a way that the energy curve shows a steady rise to the very end. They explain it by pointing out that the march from the gymnasium to the class room, or the walk to the dressing rooms and the motions involved and the time spent, in the changing of clothes, and the common use of the bath after the

gymnastics makes special quieting exercises unnecessary. My answer to this is, that if the necessity for some agency of a quieting nature be conceded, then it is the duty of the teacher to see to it that the necessary exercises are taken before the class gets out of his control. He should not rely upon what the pupils are doing afterward, in their dressing rooms, etc. That which is necessary should be done during the lesson, not be left to the capricious conduct of the pupils afterward. And I have heard no reason advanced against employing a few mild exercises at the end of the lesson. The only reason given by anybody seems to be that it is not absolutely necessary. Those who do not see the necessity for it have a perfect right to omit them. But those who believe that it favors the well-being of the pupils must not throw the responsibility upon the pupils themselves.

One more example. It is a common experience that fine coordination is impossible after severe effort. You cannot draw well immediately after having chopped wood or rowed a mile or two at a good rate. You have not the necessary control of the finer movements. That observation can easily be made by any one even if it is not already a matter of every one's experience. If the gymnastic lesson is to contain exercises requiring fine adjust-

ments as well as those calling for muscular strength and effort, it seems justifiable that the former should precede the latter, not vice versa.

We thus observe that our common experience tells us that, to gain the best results, it is not sufficient that the exercises be well-selected and all-sided, but that some attention must be paid to the sequence in which they follow each other in the lesson. In other words, the individual exercises must not be considered as perfectly independent, separate, and distinct entities having no connection with each other, no bonds of union, but as parts of an organic whole, a unity, having relations to each other, being dependent on each other, and mutually assisting each other to influence in the most favorable manner another organic whole, another unity, the individual, in which also closely dependent parts exist. It is not enough to see to it that we give only exercises which are beneficial in themselves. It does not suffice that we say to ourselves that we have applied exercises to improve all the main functions and organs. We must also consider whether all these well-chosen exercises form a harmonious lesson in the sense that one does not annihilate or unduly multiply the effects gained by the other by being placed in a false time relation to it. This is what we call *The Principle of Gymnastic Unity*.

CHAPTER V

THE COMPOSITION OF THE LESSON

THE plan of the lesson should be built upon these three principles, which are accepted by a large number of directors, while others are slowly but none the less surely drifting toward them. Exactly how the selection shall be made, exactly what functions or organs shall be considered so important that they shall have special attention every day even when time or other circumstances prohibit us from giving more or less special exercises for all, and exactly the sequence which, in general, is the best one, these are questions of application, in which we may honestly differ even when we accept the principles.

On the question of the proper sequence there is a wide divergence of opinion, and no particular order has as yet been supported with so convincing proofs that we can hope for unanimity in this regard in the near future. Because of the fact that the Swedes have paid more attention to this matter than anybody else, and because the succession advocated by them undoubtedly gives very good results, even if better might perhaps be gained by a

different arrangement, it is well in any discussion of the proper planning of the lesson to consider well their general scheme. In doing so it should be remembered that it is not an outgrowth of theoretical reasoning, and that in fact they do not endeavor to give any other reasons for the plan they have adopted than that experience has proved it to be satisfactory. It is not based on laboratory experiments, but simply and solely upon observations made directly in the gymnasium. Their plan is quite universally known as the typical Day's Order.

It represents the idea of a steady rise in the energy until the climax is reached after which follows a rather rapid decline to the end, as also the idea of all-sided activity varied in such a manner as gives the greater effectiveness to the lesson as a whole.

It begins with a series of mild, introductory exercises, always taken without apparatus, not because apparatus work is "heavy," and freework is "light," but because time is saved thereby, and because it is desirable to pass from the introduction to the real work in the briefest possible time. These exercises are not classified according to their effects upon the chief functions, but simply according to the part of the body thrown into activity, just because their purpose is to throw all main mus-



FIG. 17.

A type of activity having opposite results from those which usually prompt its use. (*See page 40.*)

cular groups into activity. I know no particular reason for the sequence in which they follow each other, and suspect that it is more a matter of habit and routine than a matter of principle. It may be noticed, however, that this introductory series to a limited degree is a miniature of the day's order as a whole, and there consequently may have been definite reasons for the sequence actually chosen. But even before we enter upon real introduction, we need to gain control of the class, we need to catch the attention, we need to place the pupils in postures suitable for activity, and we need to place them in such relation to each other and to the room, that they do not interfere with or in any way hamper each other, but that each can take the exercises with the least inconvenience and at the same time be under the effective supervision of the teacher. These introductions to the introductions, are what we call "ordermovements." This term is not to be considered synonymous with the German "Ordnungsuebungen." The latter include the former, but besides that they cover tactical evolutions, in the strictest sense, as also marches in squares, stars, circles, spirals, etc. These if practised require a high degree of attention and cannot suitably be given immediately after a lesson or strong mental concentration. They are, therefore, so far as they

are used at all, postponed till later in the lesson, when the system has been stimulated by activity, but should on the other hand not be taken so late that actual fatigue has set in.

The leg movements appear in two places in this series. This is because contraction of large muscle masses are needed to stimulate the circulation and because it is desirable that we rapidly shall gain revulsion to the muscles from the congested abdominal organs and the cerebro-spinal system. The latter can of course not be accomplished if the exercises themselves involve great attention, and among leg movements we have a large number which may be done with only a minimum amount of concentration. The first leg movement is frequently, in fact usually, combined with some form of respiratory exercise, i. e., some movement in the respiratory rhythm of such form that the chest becomes alternately expanded and relaxed. The second leg movement should be of a different type from the first one. When the Introductions are finished, we proceed to the chief work. We begin with hyper extensions of the trunk not brought about passively by the weight of the body but by strong muscular contraction of the dorsal muscles. In the execution of the tense bendings, a type of which is depicted in Fig. 15, there is great temp-

tation for the teacher to proceed faster than the ability of the pupils will allow. As has already been said, it requires no mean effort by the average person to maintain the arms fully extended above the head. When he then is required to bend backward while maintaining the arms in this position the task becomes very much more demanding, and if not controlled thoroughly by the teacher he relaxes his back and shoulder muscles, allows his body to sink down between the arms, executes the backward flexion in the lumbar region, and endeavors unconsciously to increase the depth of the bending by flexion in his knees, and the result is the deforming posture shown in Fig. 34.

To avoid this, proceed slowly, pay particular attention to the position of arms and head which also, like the former, has a tendency to advance, and make the flexion in the upper region only.

Immediately after this, a trunk-bending forward and downward is usually made, as a relief from the hyper extension, followed by some form of exercise in which the abdominal muscles are strongly contracted, for instance a stoop-falling posture, after which a leg movement or a mild form of jumping is taken. Now follow heave-movements, by which we mean exercises in which the weight of the body is wholly or partly suspended from the

shoulders. It includes all kinds of hanging by the hands, chinning, arm traveling, climbing, exercises in balance weighing posture ("rest"), etc. The chief physical effect which it is desired to give by this group is mobility of the chest in the inspiratory direction during strong contraction of the retractors of the scapulæ. It is evident that we cannot secure this in the highest degree if our apparatus forces us to bring the arms forward or close together, as for instance in climbing on vertical ropes or poles, in arm traveling on the boom, but an endeavor should always be made to maintain the head and shoulders well carried.

The exercises taken up to this time have been of a general nature; they have caused a revulsion of the circulation from the viscera to the motor organs and have mechanically expanded the thorax, without being of such severe character or such large quantity that fatigue has become noticeable. The whole system has been prepared for more special exercises. These, in accord with the previous discussion, begin with such exercises as require considerable nervous energy without corresponding strong muscular contraction; in other words, coordination exercises. Of these, the exercises in maintaining the equilibrium are perhaps the most important ones from a general viewpoint, serving to

give power of maintaining erect carriage. Balancing exercises are therefore brought in here. They are usually taken as freestanding movements, while such balancing exercises as require apparatus are commonly taken simultaneously with the heave-movements, each pupil, having finished the latter returning to his place in the formation by means of the balancing boards, executing on these the prescribed exercise.

Further special exercises now follow. Usually provision is made for two successive series of exercises for neck, shoulder and back, for abdomen, and that group of asymmetrical trunk movements which have been called lateral trunk movements. The reason why two series of these are employed is to be sought in the value attached to them as preventative and curative of common defects. It hardly needs to be mentioned that the two series should not be identical, but must be chosen in such a manner as to present the greatest variety of form; the second series, generally speaking, representing the more intense activity. For practical reasons, such as saving of time, etc., it is habitual to compose one of the series (generally the first) exclusively of free movements, while for the other apparatus is employed. The two series are always separated from each other by some milder form of

movement, either a leg or a respiratory movement, or marches, mild running, and tactical evolutions.

Immediately after the second series of the special exercises, or separated from them by some relief movements, like leg movements, come applied exercises, which represent the highest type of the work both as to general coordination and energy expenditure. The forms chosen for these are usually some form of heave movements such as serpentine, climbing of various kinds, etc., followed by vaulting, jumping, and other precipitant exercises.

With these the chief work of the day is ended, and it only remains somewhat to restore the system to its normal condition, for which a lateral trunk movement, a toe march or other mild leg movements and a respiratory exercise are commonly employed.

Such is the general scheme of a lesson given according to the Swedish system, which has gained recognition in this country. A great mistake is commonly made outside of the Swedish ranks, that this plan is a straight-jacket into which every one should be pressed. Nothing is further from the truth. It is claimed to be the experience of a hundred years that this plan enables us to give the greatest variety and greatest quantity of valuable



FIG. 18.

Strong activity of the pectoral muscles to protect the shoulder joint. (*See page 41.*)

exercises in the shortest time, and it is therefore insisted that each one does well in considering it as a reliable guide. But it must be a guide to freedom of action, not be the sign of slavish submission to dogma. It is claimed that the less prepared a teacher is for his work, the more is he in need of some such statement of what experience has taught those who have gone before him. But with the growth of his own experience he becomes more and more free from the methods of others, and should substitute his own judgment for that of his predecessors. If this experience furnishes him with a better procedure, it is his duty to utilize it. Progress is not made by changing rules simply because of fancy. If you have any reason which seems to your own judgment to be an adequate one, make the changes you desire, but do not make these changes without any reason at all. Such is rule. The teacher's individuality must have full sway. But freedom must not be confounded with lawlessness.

Let us consider some changes which because of the ever-changing conditions under which we teach must be made more or less frequently by every one, changes which are not only permissible, but absolutely required by any teacher, who is not a mere machine,

1. In the general scheme put before us, we have order movements at the beginning of the lesson. Every one must recognize the absolute necessity of their use before other work is undertaken. Order must be gained. Discipline must be established. The teacher must get into control of the class. But though this is an absolute necessity at the beginning of the lesson, it is no less necessary, that this order, and discipline, and control should be continued. Now it happens, it must happen, in every lesson, that sooner or later the order is disturbed, the control lessened, the formal discipline relaxed. Some extraneous circumstances may divert the attention of the pupils, their activity may bring the ranks awry, the distances may increase or diminish, the synchrony of motion may become lost from some reason or other. Should we then go on with our lesson without taking account of these factors? Certainly not. We shall again reestablish order; we shall again assert our control; we shall again employ order movements in order to do our work to the best advantage. The typical day's order shows us the place where order movements are absolutely essential under all conditions. In the practical work, order movements should be brought in anywhere when needed.

2. Suppose that the class shows signs of undue

fatigue while we are following the general plan. This may be due to poor judgment of the teacher. It may be due to extra hard work in the school, of which the teacher may not be cognizant. It may be due to unusually sweltering weather. It may be due to a thousand and one circumstances. Though we may decrease the general severity of the lesson as planned, by giving less strenuous exercises in the various groups, we may well think of giving a greater number of relief movements, leg movements, respiratory movements and the like, requiring little mental and physical exertion, even if the typical plan does not distinctly provide for them. We often see that long rests are given in the gymnasium. Pupils are allowed to sit or lie down. This is a mistake. The rest in the gymnasium should be furnished by change in activity, not by cessation of activity. Common sense should rule supreme over pre-arranged plans. No violation of principle is done by changing the plan according to circumstances. Common sense demands it. The plan is not our master. It is simply a guide.

3. Suppose that we have divided up our class into sections for work on the apparatus and that the latter are insufficient in number to accommodate all simultaneously in the tense-bendings, or in the heave movements, or the movements for the

neck, shoulders, and back, or the movements for the abdomen, or the lateral trunk movements. I see no reasons to uphold the inviolability of the general plan of such strength that they can overbalance the evils of giving the class some unsuitable exercises or of allowing them to remain in inactivity. The duty of the teacher under such conditions is to change the sequence for part of the class, allowing for instance some sections to take tense bendings while the rest take heave movements, and then allowing the latter to take tense bendings while the former take heave movements, part of the class to take movements for neck, shoulders and back, while others take abdominal exercises, and still others take lateral trunk movements, and so on.

4. Suppose that the time allowed us is too short to follow out the rather elaborate plan for a lesson presented here. Shall we then consider it is impossible to follow the spirit of that plan simply because we cannot carry it out to the letter? Common sense of course dictates that we shall abbreviate the plan, maintaining its essential features. Various methods of doing this suggest themselves to any thinking teacher, as for instance:

A. We may exclude one exercise of a given family, which is represented by more than one type.

B. We may exclude on alternate days exercises which, though not of the same family, have effects which, so to say, overlap each other's.

C. We may make combinations in many ways, in which characteristics of several families enter, or we may make sequences, different parts of which represent different families.

a. Make a sequence, by taking the "weighing posture" on the boom, following it by a somersault over the boom, finishing in tense bending posture, and possibly doing some exercise in that posture.

b. Or, for instance, by vaulting over an obstacle by the means of the vertical ropes, by using the seesaw, or the giant swing.

Many other methods will easily suggest themselves, by which the general idea of the typical day's order remains intact, but its usual form is so varied that it can be recognized only by those thoroughly familiar with the underlying principles. That such changes should be made with due consideration to all the conditions need hardly be stated. It would carry us too far to enlarge on this subject. Suffice it in this connection to say that if abdominal exercises be excluded some day, when lateral trunk movements in the form of trunk twisting are used, it seems to be best in accord with the principle of gymnastic totality to intro-

duce the abdominal element in some other family. We might on such a day employ as heave movements a hanging with leg raising forward, and its derivatives, while on a day when the regular abdominal exercises were given but no regular lateral trunk movements, a serpentine through the ladder would be in place as a heave movement.

5. Fancy steps and dancing are exercises for such classes who have a suitable preparation for them. Old folk dances should be taken up by the Physical Director wherever possible. Is there in the day's order, as given, any place for them? I have found no difficulty in introducing them in my lessons, without making any change in the general plan. The first instruction in the form of steps seems to be so closely allied to balancing exercises, that they may well take the place of these. As soon as the form is fairly mastered and it becomes a matter of allowing one movement rapidly to glide over into another to form a harmoniously coordinate whole, a tour or figure, its substitution for vaulting and jumping lies so near at hand, that even the most tender Swedish conscience receives no shock.

6. Play and games belong in the gymnasium as complements to the formal exercises, though they, as before stated, should not be confounded



FIG. 19.

The muscles of the back which need strengthening are inactive, while the anterior muscles oppose the strain. (*See page 41.*)

with them. A mistake seems to be made frequently by separating the games from the regular instruction, often as a suitable ending to the lesson, sometimes as a premium for lack of discipline. The majority of games require severe running. These should be occasionally used instead of vaulting and running. For small children there are many attractive little plays which may be used with such simple tactical evolutions as may be suitable for their age. An example is "The King of France, with forty thousand men, marched up the hill, and then marched down again."

If we wish to introduce some play every day, a method to be recommended is to substitute a certain game for the formal gymnastic exercise, which it most closely resembles. Thus let us for instance on Mondays exclude the regular heave movements, and play "hang tag" in its place. On Tuesdays let the balancing exercises go by the board, but play "Fighting roosters." On Wednesdays, we may exclude the formal exercise for neck, shoulder and back, and play a kind of "Tug-of-War," by having the pupils formed in line, sit down on the floor feet to feet, and grasping each other's hands, endeavoring to raise each other up to standing posture by strongly extending legs and backs. On Thursdays we might be "weighing salt" instead of ab-

dominal exercises, and on Fridays try to initiate the boys at least in the rudiments of wrestling instead of lateral trunk movements, or we may teach them to do the "Cart wheel."

In brief, the plan may be followed and still varied in so many ways that the thoughtful teacher suffers rather from embarrassment because of the richness of the material at his hands than from the opposite condition.

What objection is there to some such plan for our lessons? Are the Physical Directors prejudiced against it without reason? Or do they refuse to accept it because of inertia? Or is the plan really inferior to absence of plan?

CHAPTER VI

PROGRESSION

ANY change in the exercises in order to gain a more complete or more rapid effect in the desired direction by taking advantage of advancing development we call progression.

In every lesson there should be, as far as possible, such a change. That is the content of the principle of unity. Each group of exercises to a certain extent prepares for those which follow. There should be progression in each lesson.

But even from day to day, from week to week, from year to year, we must change our exercises in accord with the development of the pupil. Not, of course, that a program made up for to-day needs necessarily be discarded for a new one to-morrow. But sooner or later changes must take place if we shall expect that our work shall be a factor in development. Constant repetitions can, at best, only maintain the development once gained.

Nobody can state a priori how soon an exercise should be modified, nor exactly what elements of the exercise should be retained and what should be

varied. The determining factors are too many and too complex to be brought under precise laws. They depend on the ability and personality of the teacher, on the ability and personality of the pupils, on their age, strength, sex, occupation, home-conditions, on the time devoted to the work, of the furnishings of the gymnasium, on a thousand and one things varying with each class.

In such school systems where the physical training is in charge of a technically trained director, acting in a supervisory capacity, while the actual work is carried out, mainly if not exclusively, by the regular class teacher without technical training, the custom has grown up to supply the latter with slips or cards with a number of exercises. The class teacher takes card No. 1 and goes through the exercises given thereon for a certain limited time, after which she, on a certain date, drops them, substituting a new set of exercises on card 2, and so on. This is Progression, but it is progression by leaps and starts. Under the conditions, some such plan is perhaps the only practical one. It is a matter of administration. It probably could be modified somewhat to advantage. It is safe to say that no teacher with pedagogic instinct should proceed exactly in that manner. However well chosen the exercises may be, they are chosen by a

person other than the one who is to apply them, a person of different mental make-up. They are chosen and combined for an imaginary class of imaginary pupils, not for the particular class with which the teacher deals. They may be suitable for the average child, but not for the exact children in question. Every teacher should make up her own programs, using the published ones as guides to be consulted, but not to be strictly followed.

Furthermore, whether the teacher makes up her own plans or not, and even when the individual exercises are arranged in the best possible manner, so as to correspond to the ability of the class, it will always be found that one or a few are mastered before some others. These should of course be dropped for new ones of the same family independent of whether the other exercises in the day's order need to be further improved or not. In each family there shall be a progression to the highest possible ability, always however avoiding specialization.

A good plan is to make out before the beginning of the course a different set of day's orders for each day in the week, and to progress in each set somewhat independently. Thus, if we are to give lessons each Monday, Wednesday and Friday, make out three sets of Day's Orders, which we might designate as follows:

MONDAYS:

$$A_1 \ B_1 \ C_1 \ D_1 \ E_1 \ F_1 \ G_1$$

$$A_2 \ B_2 \ C_2 \ D_2 \ E_2 \ F_2 \ G_2$$

$$A_3 \ B_3 \ C_3 \ D_3 \ E_3 \ F_3 \ G_3$$
WEDNESDAYS:

$$a_1 \ b_1 \ c_1 \ d_1 \ e_1 \ f_1 \ g_1$$

$$a_2 \ b_2 \ c_2 \ d_2 \ e_2 \ f_2 \ g_2$$

$$a_3 \ b_3 \ c_3 \ d_3 \ e_3 \ f_3 \ g_3$$
FRIDAYS:

$$A_1 \ B_1 \ C_1 \ D_1 \ E_1 \ F_1 \ G_1$$

$$A_2 \ B_2 \ C_2 \ D_2 \ E_2 \ F_2 \ G_2$$

$$A_3 \ B_3 \ C_3 \ D_3 \ E_3 \ F_3 \ G_3$$

All A-s, a-s and A-s are of the same family, but of different types, A_1 , A_2 , A_3 , denoting three exercises progressively arranged out of the same type, in the same family from which a_1 , a_2 , a_3 are three progressively arranged exercises of another type, and so on.

In practice, the progression on successive Mondays could then be denoted as follows:

$$A_1 \ B_1 \ C_1 \ D_1 \ E_1 \ F_1 \ G_1$$

$$A_1 \ (B_1) \ B_2 \ C_1 \ D_1 \ E_1 \ F_1 \ G_1$$



FIG. 20.

The wand acts as a brace to overcome which the pectoral muscles contract. (*See page 42.*)

$(A_1) A_2 B_2 C C_1 D_2 E_2 F_1 G_1$
 $A_2 (B_1) (B_2) C_2 D_1 D_2 E_1 F_2 G_2$
 $A_3 (B_3) (C_1) (C_2) E_2 E_2 F_2 G_3$
 $A_3 (B_2) (B_3) C_3 D_3 E_2 (F_1) F_3 G_3$
 $A_3 B_3 C_3 D_3 E_3 F_3 G_3$

the exercises in parentheses denoting repetitions.

But the important question for us to decide is how to judge which one of a number of exercises of the same general effect should be taught first, and which one should succeed. Which one of all the A-s should be used as A_1 , which one as A_2 , A_3 ? What is the difference between B_1 , B_2 , and B_3 , which makes us place them in that definite order? The science of gymnastics is in such an embryonic state that we have as yet established no generally accepted laws according to which we may progress. We mostly rely upon a more or less indistinct feeling that a certain exercise is "harder," "more difficult" than another. And in our present incomplete knowledge it is impossible to give universal laws. All that may possibly be done is to make an endeavor to put into words some of the experiences gained in individual cases, in the hope that they may serve as material out of which at some time in the future definite laws may be formulated.

The gymnastic exercises with which we, as teachers, deal are muscular contractions, induced by nervous impulses. The muscular contractions and the nervous impulses are the causative forces. The effectiveness of a physical force, or, as the physicist expresses it, "the moment of the impulse," is measured by the formula *fr.t.* which, translated into common language, means that the effectiveness is the product of the intensity of the force, the distance through which, and the time during which it acts. The time will probably arrive when only exact statements borrowed from the physical and mathematical sciences will be admitted to full citizenship in a biological science. But that time is certainly not yet at hand so far as concerns gymnastics, and we will therefore limit ourselves simply to say that, according to the general formula, the effectiveness of an exercise may be increased, progression may be made, by increasing either of the causative agencies, the muscular contraction or the nervous impulse either in intensity, extent, or duration.

Supposing the extent and duration of a muscular contraction to remain unaltered, its intensity may be measured by the resistance which is overcome. This resistance is of a complex nature. Of most importance is that offered by gravity, which is dependent on two factors, the mass (weight) moved (or sus-

tained), and the lever upon which gravity acts. Other conditions being equal, the intensity of the muscular contraction is due to an increase of either; and our first "*Progressive Law*" is therefore:

(1.) *Of two exercises involving the same muscular groups in contractions of the same extent, speed and duration, that one is more advanced in which a greater weight is moved, or sustained.*

There are three distinctively different modes of progression according to this "Law." In "Standing Arm bending upward" the weight moved by the flexors of the elbows is that of the forearms. To increase the intensity of the contraction, the apparently simplest mode is to add a new weight by holding an object in the hands. This is a common means of progression everywhere, though it is more habitual in this country, less in Germany, and still less in Sweden. In fact, it is a quite general impression that the Swedes never use any external resistance at all. It may not be out of place to deny that here. There is no objection by the Swedish gymnasts to the employment of external resistance of any kind. The objection is not against the apparatus, but against the manner in which they are commonly used. In the Royal Central Institute, as well as in the Swedish Army and Navy, the rifle is frequently employed for the purpose of fur-

nishing an extra weight, and dumb-bells, Indian clubs, and metal wands are not totally unknown, though their use is not generally encouraged because of what is considered to be a great temptation to use them erroneously, and because the increased resistance may be gained by other means which are considered both simpler and safer.

One is to employ the resistance of another person. By the mutual resistance of the gymnasts, time is saved. There is no loss in fetching and removing the portable apparatus, and there is no reason why a large number of exercises should be performed in succession with this other resistance, causing local fatigue. This, they say, is one of the inconveniences of dumb-bells, Indian clubs, etc. But furthermore, the resistance offered by the apparatus is fixed and invariable, while the moving force, the muscular contraction, varies with the degree of contraction. It is therefore more advantageous to have an intelligence behind the resistance, by which it can be moderated according to the changing strength. In gymnastics for therapeutic purposes, this mode of increasing the intensity of the contraction is extremely common, and can hardly be surpassed, the resistance being given by a trained gymnast. In the usual class work it is, of course, far less applicable, because the pupils can

only in exceptional cases be supposed to have that training and gymnastic sense without which the supposed advantage becomes a delusion. It can practically only be used in classes of adolescents or adults with a training extending over several years.

In this connection it may perhaps be appropriate to call attention to one undesirable feature of such apparatus in which the resistance is furnished by an elastic body, a spring or a cord. In this, the resistance is smallest at the beginning of the movement, and grows constantly to its end. But, aside from considerations of leverage, the force with which a muscle contracts, decreases with the degree of contraction. When the muscle is strongest we have least resistance. When the muscle is weakest, the resistance is greatest.

Instead of using external weights, elastic resistance, or opposing the movement by another person, we may find the increased weight within the body itself. We are in the habit of speaking of the attachments of a muscle as its origin and its insertion, meaning by the former the fixed point and by the latter the movable point. But this fixity of one end and this mobility of the other is not absolute. The designation is made in accord with the habitual conditions. But these may be reversed, so that the commonly fixed point becomes the movable one

and *vice versa*. And by this "reversal of origin" changes of the weight may be made. Thus, for instance, the hips are flexed by a number of muscles, the most important of which are the psoas and the iliacus. In a lying posture their contraction will flex the lower extremities upon the trunk. But if the feet be supported, the same muscles will flex the trunk upon the extremities. This is an example of progression by reversed origin. Extension of the elbows is done by the triceps. Under normal conditions the moving weight is the forearm. But by inclining the body forward and supporting it by the hands, the lower attachment becomes the fixed point, and the weight moved will be a considerable portion of the body. The origin has been reversed and the progression made. The flexors of elbows normally have their movable point below the elbows and the weight they move is only the forearm. But fix the latter, for instance, by hanging, the origin is reversed, and again a considerable part of the body weight constitutes the load to be overcome. It is advisedly said a "considerable part of the weight," because though it is commonly said that in this posture the arms are flexed by the biceps group, we of course all understand that they by no means do it all, but that the main work in reality falls upon the adductors of the upper arms. By suitable pos-



FIG. 21.

Pectoral activity often mistaken for dorsal. (*See page 42.*)

tures the work of the flexors may be nicely graded through a long series of exercises of ever-increasing difficulty, and to a certain extent the necessity of utilizing external resistance is thereby obviated.

Increased intensity of muscular contraction is also required if the weight, though unchanged, is differently distributed so as to act upon a longer lever, which may be expressed in this law:

(2.) *Of two exercises in which the same weight is moved an equal distance during an equal time, or sustained in the same position for an equal time, that one is more advanced in which the weight acts upon the greater lever.*

If one assumes a lying posture and lifts the legs with extended or with flexed knees, the same weight is moved in both cases, but in the former the gravity acts upon a longer lever. Similar relations determining the progression we have in reclining the body in a sitting posture with the arms extended above the head or placed on the hips.

It should be noticed that the weight lever changes during most movements. Thus in the lying leg-raising given as example, the lever is greatest at the beginning of the movement, and decreases steadily until the legs form a right angle with the body, when it is zero. If the movement be continued beyond that point, the lever becomes a minus

quantity, that is gravity no longer resists the flexors but assists them, or relieves them of all work, the extensors of the hips entering in contraction in their place. In connection with this "law," it should also be observed, that any progression according to the first "law" by means of external weights also increases the weight lever, so that the progression is double.

Finally, we must not forget that in formulating either of these "laws," no consideration has been taken to the inertia. When a movement has acquired a certain speed, only a minimum of muscular effort is required to maintain it. It continues greatly because of its own inertia. Thus, for instance, a giant swing requires little muscular effort when it has been begun, but if the center of gravity be moved close to the axis of motion by bending of either the arms or the legs, considerable strength would be demanded for its continuation.

The two foregoing "laws" deal with the resistance offered by gravity. But there are other agencies opposing motion in the body. One of these is friction in the joints, in the play of tendons, muscles, and various other tissues upon each other. Nature provides abundant means by which this friction is minimized. Physiologists as well as gymnasts gen-

erally consider the resistance by friction as too insignificant to be taken into account. The articulating surfaces are smooth. They are lubricated by synovia, bursæ exist wherever friction threatens to become an obstacle to free motion, the tissues are generally slippery so as to glide easily over each other. It has been estimated, however, that, in spite of all these labor-saving devices of nature, about one thirtieth of the whole muscular force is expended in overcoming internal friction. If a motion requires small muscular effort, the friction is small. With increased effort it grows apace. If a group of muscles capable of lifting one hundred pounds contract in order to lift only ten pounds, the internal friction would amount to only a third of a pound or one third of one per cent. of the capacity of the muscles. But if they are required to lift ninety pounds, there would be an addition in resistance which would amount to three pounds, or three per cent., which may not be insignificant.

Furthermore, this internal friction is not always a hindrance to the muscles. It sometimes assists them. We are prone to consider that all motion in the body is caused by muscular contraction; we often forget gravity as a cause of motion. And friction of course always resists the motion what-

ever its cause may be. If I lift my arm sideways, the motion is caused by muscles opposed by gravity and friction. If I allow the arm to sink slowly, the motion is caused by gravity and is opposed by muscles and friction combined. The former is true in all "concentric" activity. The latter in all "eccentric" activity. These terms signify—concentric, that the main active muscle during its activity is gradually growing shorter; eccentric that it is growing longer.

Therefore we gain this "law":

(3.) *A Concentric Movement is more advanced than its Eccentric complement.*

Suppose, for instance, that a person hanging by the arms wishes to bend his elbows to "chin." The muscular effort needed may be denoted by M, the friction by F and gravity by G. The condition for his ability to execute the exercise is then that his muscles shall be able to overcome the combined action of gravity and friction, or, mathematically expressed:

$$M > (G + F) \text{ or } (M - F) > G$$

Now, if, after having bent his arms, he allows the body to sink with the same speed used in raising it, gravity will overcome the resistance offered by the muscles and friction, which, if m denotes the

muscular effort, f the friction and G gravity, may be expressed as

$$G > (m + f)$$

A comparison of the two gives:

$$(M - F) > G > (m + f)$$

And if the value of friction or one thirtieth of the muscular effort, be inserted, we have:

$$29/30 M \quad 31/30 m$$

Suppose the average muscular effort to be 150 pounds, there is a difference in the two movements of about 10 lbs. solely because of friction, which by no means is insignificant. Many exercises may therefore well be taught eccentrically before the concentric part is essayed. Suppose that a boy wishes to acquire the ability to "chin." Not that the accomplishment is of so great importance that much time should be spent on it; but many do wish to do so, and no harm can come from it if certain precautions are taken. He may well step up on a bench of sufficient height to enable him to grasp the object firmly, while his arms are bent, sinking down gradually, and thus gaining the strength he desires. Of course the leverage of all the motor muscles is better in the eccentric movement than in the con-

centric movement, which undoubtedly plays an important part in the greater ease with which the former is executed. But the importance of friction can not be excluded.

Reclining the body backward from a sitting posture is easier than raising the body from lying to sitting. In this case, the case is still more complicated: we have not only to take into consideration the change of leverage of the motor muscles, but also the increased leverage of the weight which comes with the increase of the angle in the hip-joint.

We have already several times spoken of the part played by the antagonistic muscles in the execution of a movement. Within certain limits, at least, the resistance offered by the antagonists may be voluntarily increased and thereby the contraction required of the motor muscles be increased or decreased. We may, therefore, consider it a possible "law":

(4.) *A Movement may be advanced by voluntary increase of the antagonistic action.*

The possibility of increasing the resistance by this means has received considerable attention of late by a certain class of advertising Teachers of Physical Culture. The theory upon which they found their peculiar claims is, if I understand it rightly, that natural contractions do not suffice to



FIG. 22A.

When the weight is passively suspended, the exercise has practically a negligible value. (*See page 43.*)

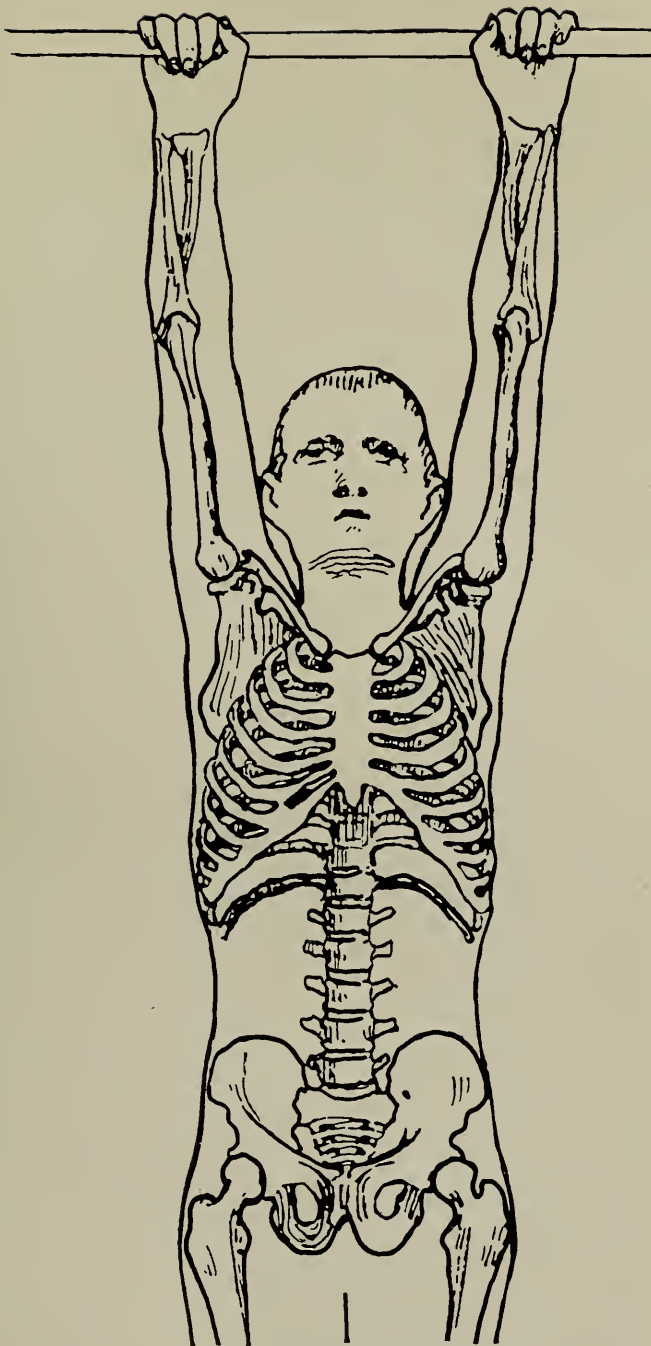


FIG. 22B.

The bony framework of the shoulder girdle as influenced by passive suspension. (*See Fig. 22A.*)

give in a brief time the necessary stimulus to increased nutrition. In order to gain this advantage, the muscular contraction must be opposed by artificial means. Hitherto the most commonly employed method to supply the desired additional resistance has been by external weight. But these increase the strain upon the heart. And to obviate this evil, and at the same time gain the desired amount of energy expenditure, the so-called "physiological" method of utilizing the antagonistic resistance has been devised.

It is hardly necessary to call the attention to the fact that every link in this chain of reasoning is fallacious. External weights are not necessary to gain complete and powerful contractions. If external weights be added, they do not interfere with the cardiac action, except if they be moved while the respiration be interrupted, that is, if an effort be made with closed glottis. Circulation is favored and the heart assisted by alternating contractions and relaxations. When, as in movements with severe antagonistic resistance, the field of simultaneous contraction is enlarged and its duration increased, there is on the contrary strong probability that the circulation will be seriously interfered with, and an undue strain be placed upon the heart. And this is not all. One of the great functions of gym-

nastics is to develop the ability to localize the nervous impulse to its proper paths, to those paths by which it can be most economically translated into muscular contraction for the execution of natural acts. The development of the motor impulse goes from a general diffusion to finer and finer localization. The method of using voluntary antagonistic resistance is contrary to the laws of nature, inasmuch as it strives, consciously or unconsciously, to make permanent the stage of diffusion, to nurse rigidity of motion which we should, in the interest of economy of energy and grace, do everything possible to counteract and eradicate.

So far as known, reference to the possible desirability of this method of progression has only been made by one reputable author, the late lamented Posse. He mentions it only, so to say, parenthetically, and I can only explain it as an error of judgment.

Strange to say, the advocates of relaxation, *par excellence*, not infrequently employ exercises in which a totally unnecessary voluntary increase of the antagonistic resistance is called for.

The ease or difficulty of a movement depends also on the conditions under which the muscles work. In the foregoing we have mentioned the changing leverage of the motor muscles. I have been unable

to think of any example in which this matter alone is the determining factor, and have therefore not endeavored to formulate a "law" to cover the cases. But the ability of a muscle depends on many other factors, of which one of the foremost is its condition when it begins to move the weight. Its working capacity decreases with its degree of contraction. If a muscle receives its load when it is fully extended it is able to lift a greater load, than if the load is attached to it after it has been partly contracted. Whether this is due to the assistance given by the mere mechanical elasticity of the tissues, or whether it depends on difference in the number of muscle fibers which can be brought to bear upon the load, seems not to be settled. Both factors probably enter, and the fact is undoubted. Hence if a starting posture be chosen, in which the attachments are strongly separated before the movement is begun the execution becomes easier, requires less energy, than if the attachments are approached. In the latter case a certain amount of contraction is necessary for the mere purpose of "taking in the slack," if this expression be allowed to convey the mechanical idea, instead of being taken in its literal sense. Therefore:

(5.) *A movement involving a certain muscle group in activity of a certain kind becomes more*

advanced if the attachments of the active muscles are approached to each other in the starting posture.

Take Lying Leg-raising as an example. The motor muscles are the flexors of the hips. But the activity which is especially desired in this exercise is that of the abdominal muscles which act as fixators for the pelvis. The rectus abdominis may be chosen as a type of these in this example. Its lower attachment is on the pubic arc, its upper on the thoracic wall. The position of the arms determines to great extent the position of the latter. If the arms be raised above the head, or the hands be placed behind the head, the sternum and ribs become raised and fixed in this position, the rectus abdominis consequently moderately extended, and the leg-raising takes place easier than if the arms are down by the side, in which case the first part of the contraction only serves to depress the costal cage until sufficient fixity has been gained to give purchase. This approach of the origin to the insertion may by a suitable posture be carried to such an extent that certain muscles ordinarily engaged in a movement are actually prevented from furnishing any help in the execution. Take for instance the muscles usually engaged in the plantar flexion of the ankle. There are many of these but we may limit our attention to the gastrocnemius and the

soleus as representatives of two types, the former having its upper attachment above the knee-joint, the latter below. If the knee be rather sharply bent, the gastrocnemius becomes relaxed to such an extent that its contraction meets little or no resistance and the other muscles must execute the work unaided. If I rise upon tiptoes from the usual standing posture all the calf muscles cooperate. But if I then begin to bend my knees, the gastrocnemius gradually loses its power, cannot, to the same extent as formerly at all events, cooperate with the soleus and the other one joint muscles. These must then, with a smaller contractile mass support the full weight of the body, and as a result the heels will show tendency to descend, which can only be overcome by a special effort. It is of course not denied, that gastrocnemius always contracts synergetically with the soleus. This may well be taken for granted from the mere anatomical fact that both receive the nerve supply from the same source, the internal popliteal nerve, but that they also are to some extent independent, as may be established by palpation, is explained if we consider that one branch of this nerve, the posterior tibial supplies the soleus in conjunction with the other extensors of the ankle, the tibialis posticus, the flexor longus digitorum and the flexor longus

pollucis, but furnishes no fibers to the gastrocnemius.

It is of course evident that if, by some such means, a posture is to be maintained or a movement executed by a smaller muscle mass we deal with a more difficult mechanical problem than if a larger mass is used to uphold or move the same weight. We may thus state that

(6.) *An exercise may be advanced by the selection of such posture that thereby a smaller muscle mass is obliged to execute the work normally done by a larger mass.*

This "law" gives an unsought opportunity to touch upon a matter which is of considerable interest to us as students. Many muscles have a double effect. Branting asserted as a result of his experience that if such a muscle from some reason or other be prevented from executing one of its functions its other effect would be eliminated. This was denied by many, who claimed that Branting's observation was at fault. Now, however, prominent physiologists have accepted this view-point. Landois, for instance, gives these examples: "If the fore arm is strongly pronated and then flexed in this position, the biceps remains out of action; or with strongly extended elbow, M. Supinator brevis alone acts as supinator, not the biceps. The

M. Masseter raises and at the same time pulls the lower jaw forward. If now the jaw be pulled strongly backward (so that the masseter is not allowed to pull it forward), the masseter does not take part in the raising of the jaw. The temporal muscle simultaneously raises and pulls the jaw backward. If the jaw be kept strongly forward, and raised in this position, the temporalis remains inactive. Only by the strongest possible effort, or when the position of the bones are peculiarly influenced by other mechanical causes, do the muscles of this group (those having a double function) take part in this one-sided effect."

The preceding "laws" deal with progression because of changes in the intensity of the muscular contraction. To certain extent connected with this, we might well consider the possibility of a progression going in exactly the opposite direction from the last mentioned method namely by increasing the number of muscles acting con-jointly. By means of an ever-increasing isolation of the active muscles we gain of course increased local effects, by increasing the number of muscles taking part, we, on the other hand, increase the general systemic effects. We might thus express this "law":

(7.) *A movement may be advanced by increasing the mass of muscles taking part.*

It should, however, be observed that with the exception of such exercises which fall under the previous "law" there seems to be no opportunity to progress in this manner within the same type of exercise. This method of progression seems always to mean a change of type. If we use heavemovements as a type, it is clear that we may within the pure heavemovements, progress for instance from undergrasp hanging armbending to overgrasp hanging armbending according to the previous law, but if we wish to call forth a more general effect, by drawing in a larger number of muscles we are practically obliged to choose our exercise from a different type. If we desire general systemic effects of a higher degree, we may well consider the choice, for instance, of a rope climbing in which many muscles enter into contraction.

The previous "laws" have all dealt with the relation of the active muscles and the resistance. But the extent and duration of the movement should also receive consideration. Thus we may wish to cause a chest expansion by means of a trunkbending backwards. It is clear that the greater the curve the greater the expanse. Without adducing further examples we may therefore say that



FIG. 23A.

An active suspension of body weight. (*Compare with Fig. 22A.*)

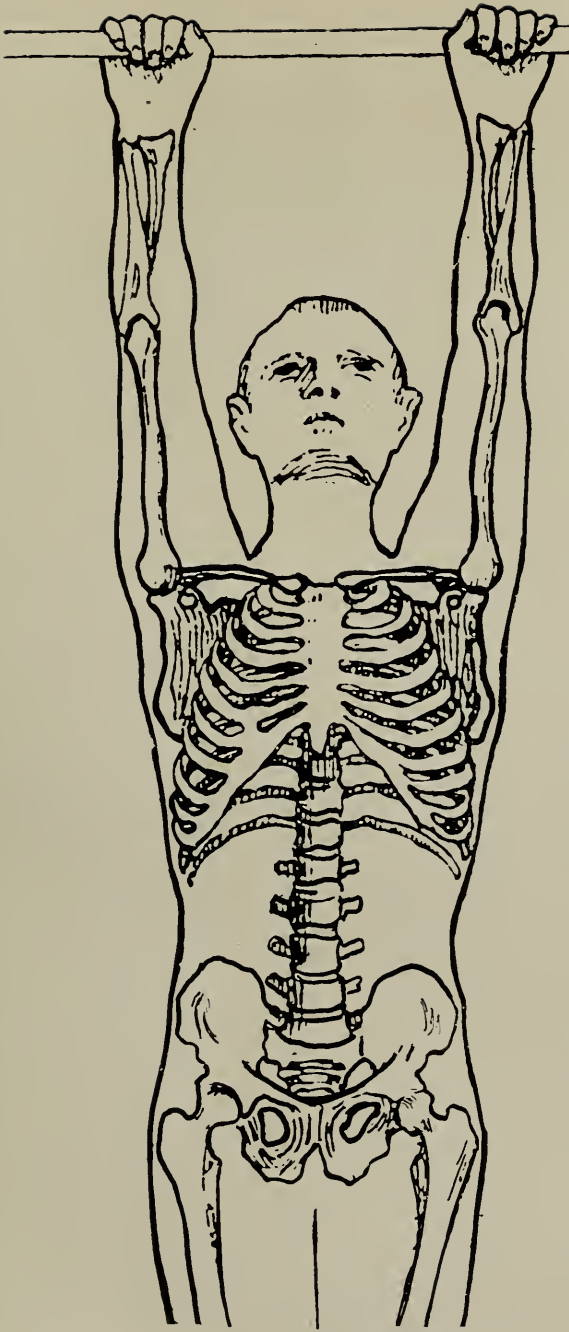


FIG. 23B.

The bony framework of the shoulder girdle as influenced by active suspension. (*Compare with Fig. 22A.*)

(8.) *A movement may be advanced by carrying it nearer its mechanical limit.*

Progression according to this "law" is closely bound up with some of those already mentioned. It has already been mentioned that the lever upon which gravity acts varies with the extent of the motion. In the trunk bending backward the lever goes from beginning to end. In lying leg raising it diminishes with the progress of the movement, but in spite of this, there is required a constantly growing effort because of the increased shortening of the active muscles, etc.

The duration of an exercise may be increased in two ways:

(9.) *An exercise may be advanced by increasing the duration of the single contraction.*

(10.) *An exercise may be advanced by increasing the number of its repetitions.*

Examples are not necessary to make clear either of these procedures. They are self-evident.

In the preceding "laws" an endeavor has been made to sketch the common means by which we may progress by keeping our attention on one side of the gymnastic exercise, the muscular contraction. It need hardly be said that the object in view is not the effect on the muscular tissue. By the

muscular contractions we desire to influence the vascular system, the nervous system, the respiratory functions, the digestive tract, the skeleton and its articulations. The effects on these various organs are the important ones, and the "laws" formulated are expressed in terms of muscular contraction only because of convenience.

But an exercise involves not only muscular contraction but also a nervous element. And this must be taken into consideration when the question is of Progression. By means of our exercises we strive to place our muscles under control of the will. Progression can therefore not be limited to mere mechanical problems, but must follow the laws of psychic development. Psychology is as yet so indefinite that we can hardly be expected definitely to formulate general conclusions. But at all events it has progressed sufficiently to support at least some of the results to which we have arrived by our own observation.

The gymnastic teacher finds, for instance, that to gain good results he must, like all teachers, rivet the attention of the pupil to the work to be done. He finds that when the attention is diverted to other things, the exercises suffer. He knows that if his class performs an exercise slovenly, his first means of correction is to repeat the exercise with

a sharper command. This sharper command then attracts the attention. And the less clean cut, the more monotonous the commands, the more difficulty the pupil experiences in attending to the exercise. Now, though psychologists have not been able to give us a satisfactory definition of attention, they have studied some of the factors which influence it. Among these are the bigness and the brightness of the stimulus. Bigness and brightness both attract attention. The bigger and the brighter the stimulus, the less voluntary effort is required by the individual to react to it. And *per contra*, the greater voluntary control the individual has over his attention, the smaller and duller may the stimuli be to induce correct reaction. The first time an exercise is taught, it may attract and hold the attention because of its newness, but after a few repetitions this wears off and the command for it may suitably be given in a loud, plain, sharp, clean-cut manner. The more frequently the exercise has been taken, the more may the word of command approach the usual conversational tone. Similar experiences we may gather from the toys of children. Bright colored balls, for instance, attract the attention and induce motor activities better than those held in a dull gray tone. All this may then be expressed in this "law":

(11.) *An exercise may be advanced by a decrease in the bigness or intensity of the stimulus.*

We also learn from personal experience, as well as from our Manuals of Psychology, that attention cannot be riveted to more than one thing at a time. It may oscillate so rapidly from one focus to another, that we may get the impression that one and the same focus includes several objects. But, as a matter of fact, attention to several objects is intermittent. So far as motor activities done with full attention are concerned, they include several distinct factors. There are the elements of direction, of distance, of speed, of duration, etc. If we are going to teach a new movement, we all consciously or unconsciously separate these elements, paying attention first to the one, then to the other. Suppose that you are teaching a series of Indian club exercises: you not only sub-divide this series in simpler component exercises, but in each of these you first teach the element of form more or less slowly, and only when this is fairly well established do you endeavor to have it repeated in the desired time. So with all exercises. We may therefore, perhaps, be warranted in putting these experiences in the form of some "laws."

(12.) *In teaching an exercise of a given form and speed one of these factors, generally the form,*

should first receive our undivided attention, and a progression is made in the same exercise by gradually requiring more perfection in the second factor.

It is of course clear that an exercise consisting only of a single movement and return is easier of execution than one consisting of several distinct movements. It is then a general "law," which needs no discussion at all, that

(13.) *Exercises of one count should precede those of two counts, to be followed in turn by those of three, four or more.*

And also that when an exercise of more than a single movement is first taught, each of these movements must be treated as a separate exercise, or, in other words,

(14.) *Each count of an exercise shall in the beginning have its separate command by the teacher, and progression within the same exercise may be made first by the pupils counting aloud, then silently for themselves, until finally all counting is done away with and the several counts are executed upon one single command by the teacher.*

If two exercises, each consisting of, let us say, two counts, have been taught, both as to form and time, and we wish to make a sequence of the two, the problem is to go over into an exercise consisting

of four counts which present differences in form. In many simple exercises this transition may well be made immediately, but in many we will find it more conducive to correct execution to make a short series of each of the separate exercises. Thus:

(15.) *After an exercise consisting of more than one movement has been mastered both as to form and time, progression may be made by teaching a short series of the exercise to be executed upon one single command.*

(16.) *Similar exercises in different directions shall only be used in series without intervening commands when each exercise has been repeated in a correspondingly long series in each of the individual directions.*

After having taught, for instance, arm stretching sidwards, and arm stretching upwards, we might thus well give a series of two arm stretchings sidwards upon one command, and a series of two arm stretchings upwards upon one command, before we combine the two into a series of one arm stretching sideward and one arm stretching upward.

Similar conditions should guide us in combinations of movements of different parts into one exercise. Each component part of the exercise should



FIG. 24.

If the elbows are bent in the shoulder plane, chest elevation and expansion result. (*See page 44.*)



FIG. 25.

Chest depression is brought about by the ordinary "chinning."
(Compare with Fig. 24.)

first be taught separately before the combination be attempted.

(17.) *Combinations of arm movements with those of head, trunk or legs, head movements with trunk or leg movements; trunk movements with leg movements, and so on, shall only be practised after each movement has been taught separately.*

(18.) *Two such combinations should precede three or more.* Thus: Yrd (c) st Hand rotation with Head turning; yrd (c) st. Hand rotation with Heel raising; and yrd (c) st. Heel raising with Head turning, should all precede yrd (c) st. Heel raising with Hand-rotation and Head turning.

In many exercises, in fact generally, it is desirable that certain parts of the body shall be held immovable while others move. To maintain immobility is in itself an exercise demanding practice, and should be treated as an exercise. Inhibition of movement is a matter of education. To maintain the arms extended in the prolongation of the body in standing is quite easy. To incline the body forward from a standing posture when the arms are low is also easy. To make this inclination forward with the arms extended upward and immovable is a task of some difficulty, requiring quite a good deal of control. And to execute

movements with the arms while the body is held in the inclined posture, the arms starting and returning to a position in the prolongation of the body is still more difficult. If we wish to practise such exercise, we must therefore see to it that the main difficulties have been conquered which meet us in assuming the posture itself which shall serve as a foundation for the exercise. In other words:

(19.) *An exercise must proceed from a well-known starting posture, and the assumption and maintenance of this posture must be well practised before it be used as a starting posture for exercise.*

Take, for instance, exercises on the parallel bars. We all know that it requires a considerable degree of strength and coordination to maintain the usual starting posture. It must be practised assiduously before we can have a right to add exercises, for instance, with the legs. Every such exercise not only prolongs the period during which the posture must be maintained, but diverts the attention and changes the mechanical relations, so that errors of form are inevitable, if they are begun too early. It is of course a matter for each teacher to decide for himself when the time has arrived for him to begin exercises from this posture; but the general tendency is to hurry too much. The progression must necessarily be very slow when it is a matter of com-

plete reversal of the functions of a part, when the movable shoulder-girdle is to serve the rôle of the fixed pelvis.

It has been maintained that the location of the sensory organs give us the clue for progression as to direction. The sense-organs are mainly directed forward, while they give us little assistance in motions backward. Exercises should, therefore, begin forward, proceed to the sides, and backward should be the last. This reasoning seems fallacious or at least inadequate. Motions are not made primarily forward because the sense-organs are directed forward. The sense-organs are located forward because motions are habitually made in that direction. In other words, it is not the location of the sense-organs which should determine the direction of the motions, but the habitude of motion. Thus:

(20.) *Exercises which from their nature may be executed in several directions shall begin in that direction in which similar movements are habitually performed in daily life.*

No one, for instance, would think of beginning to teach a march or a jump in any other direction than forward. But it is a mistake to say that the backward direction should always come last. It is a matter of experience in the gymnasium as well as

a psychologically established fact that a movement in one direction is best followed by a movement in exactly the opposite direction; and, generally speaking, it is safer to assume that a motion in a forward direction should immediately be followed by the corresponding one backward, not by the one sideward or in an oblique direction.

But the matter of direction, though influenced by the ease with which conceptions of directions are formed in the mind of the pupil, should be more powerfully determined by our desires to counteract the influences of daily life. There motions in a forward direction prevail, and they give as a result, if increased, many evil effects. We should not begin our instruction by emphasizing these effects. Our arms are habitually moved forward. The result is incongruity in strength and ability between the anterior and the posterior muscles. Why should we then begin with arm raising and arm stretching forward? To cultivate the conception of the forward direction? That is fairly well established when the child comes to our classes. Better by far it seems to begin with arm movements sideways which give us some counteracting effects, reserving those in a forward direction until such control has been gained that they may be done without the deforming influence of the shoulder-blades

being moved forward (Fig. 13). Our heads are habitually moved forward until the neck is habitually carried too far forward. Why should we especially teach that as an exercise? We should begin with head bending backward. Our legs habitually move forward. Why should we begin with teaching the children to lift one leg forward, when by so doing we induce an erroneous form of the back? Why should we make an arm traveling forward before we make one sideways or backward, when the two latter are correctives; the former on the contrary always tends to exaggerate the habitual postures of head and shoulders?

Frequently it is possible to utilize several senses or external features to make easy the execution of an exercise. Alignment of a rank may first be made by using both sight and touch, and progression be made, after some practise, by taking the alignment only by vision. Marches are easiest done in the flank formation; then in front formation; in either case they should first be taught in the direction of the gymnasium or across it, and afterwards they may be made diagonally. If we keep the feet at right angles, we take a foot placing in the direction of the feet very much easier after a facing of forty-five degrees, so that the movement of the foot goes in the direction of the ranks or in

a perpendicular direction to it. And so on. This may perhaps be expressed by the following "law":

(21.) *An exercise is easiest performed if several senses are used simultaneously to impress the direction, and an advance may be made by gradual withdrawal of this assistance.*

The general rule has already been given that all exercises involving motion of a single part should precede the more complex exercises in which several parts move together. In practise, this has been applied to a further extent than should reasonably be done. In many manuals we find it recommended for instance that one arm shall be raised, stretched or bent, then the other, and progression be made to the simultaneous motion of both arms. This is wrong. The arms are so closely connected with each other in the habitual movements of life that it requires a considerable degree of inhibitory power to maintain the one immovable while the other moves. To a less extent the same is true of the legs, and if the movements of the legs be such that the added weight is not of paramount importance, their simultaneous motion is by far easier than the separate motion of each. We may therefore consider it as a "law" of quite general applicability:

(22.) *Bilateral movements of the extremities*

shall precede unilateral ones, and these be followed later by asymmetrical ones.

Generally speaking, any change either in form or time, requiring new coordination complexes, means added difficulty. Several of the preceding "laws" express this view. We will only add one more, viz., that:

(23.) *Exercises which have been taught in a definite time are advanced by any change of the time.*

A movement taught slowly is advanced by being taught rapidly. If the execution has been rapid, advance may be made by changing to a slow time. If the different phases of an exercise have followed each other in a certain rhythm, any change of the rhythm constitutes an advance.

The "laws" here given can hardly be expected to supersede the verdicts of experience. They should, however, assist the teacher in understanding why in a given case he finds that a certain exercise should precede another. They no doubt should be modified; new ones should be added; some may be struck out as covering too few cases. But it is believed that they may be utilized as a basis for a study of progression, a question which as yet is comparatively little understood.





FIG. 26.

In arm bending from postures of this type, the elbows should be kept in the shoulder plane.
(See page 45.)



FIG. 27.

The activity loses most of its value if the scapulæ are abducted and elbows carried forward.
(Compare with Fig. 26.)

CHAPTER VII

GENERAL CONSIDERATIONS OF METHOD

WHATEVER the system may be which we accept, whatever the foundation principles which move us, whatever the chief aim we seek, each one has his own personal method to apply that system, to actualize these principles, to gain that aim.

The system and the method should not be confounded. Two teachers striving for the same end, having the same fundamental principles, that is, believing in the same system, may seek to gain the results by widely divergent methods. A good system may easily be valueless in the hands of a teacher with bad methods; while a poor system may at least be made to appear attractive if it be applied according to superior methods. The Method is essentially a matter of the teacher's personality. The differences of systems are apparently fading away. We already see dimly in the future the hopeful rising of universally recognized fundamental principles upon which a Science of Gymnastics may be founded, and when it happens, national and personal appellations will no longer be recognized

or tolerated. Increase of knowledge will result in the death of antagonistic systems; it should also make us less dependent on authoritative dicta, more individually free, less machine like, more human and personal, and our methods will therefore grow ever more divergent.

But even so they must not become lawless. They must serve our principles. When we become less trainers, more teachers, our methods, however different they may be, must in their general aspect, correspond to the general laws of Pedagogy.

The most general of these "laws" is probably that which decrees that the teacher shall arouse his pupils to self activity of the highest order. We cannot do the work for the pupils. We can simply assist and guide them along the road from the simple to the complex; from the easy to the difficult; from the known to the related unknown. They themselves shall find and traverse the road, being drawn along by the irresistible force of their own feeling, their own desire. There must be no *pro forma* performance of tasks imposed by the authorities, but there must be self-willed efforts leading upward and ever upward. No work in the schools can fulfill its educational purpose if it be considered by the pupils as mere toil and drudgery. By the old education, symbolized by the rod, the

pupils were driven to their work. The new education, which had its first practical application simultaneously with the general upheaval contemporaneously with the gymnastic renaissance, is characterized by interest, joy, pleasure and happiness. Guts Muths called gymnastics work in the garb of play. There should be no doubt about gymnastics being work; but it should be made willing work. We must attach interest to it. Whatever the system may be, whatever methods be utilized, this must be ever in our minds, that uninteresting work always spells failure. And this not for children merely. There is no difference between child and adult in this regard, that work without interest is poorly and slovenly executed, and shirked as much as possible. Whatever the age of the pupils may be, work combined with interest is well done; it is a pleasure and an enjoyment. No sigh of relief, but rather one of regret escapes them at its end. So with gymnastics. If there be no interest attached to it, it is poor gymnastics. If it be interesting, it may be good gymnastics.

But there is this difference between the adult and the child, that the interest of the former need not necessarily be immediate and direct, but due to the knowledge that certain mediate and indirect benefits may accrue from a work which in itself is

uninteresting. For the sake of remote benefits, the adult may be brought to exert himself with vim, with vigor, and pleasure to a labor which in itself is the merest mechanical toil. The child, on the other hand, is not able to see or appreciate to the full value the distant and indirect benefits, but must find the interest in the work itself, or in something immediately connected with it. It is only the force of authority which can make the child perform exercises to which no immediate interest is closely knitted. The adult may find interest in even such apparent inanities as stretching his arms in various directions at the command of a leader, or the mechanical labor of pulling on a pulley-weight for every day of a whole year, if he knows, or believes, for instance that his health will be benefited thereby. The child may find interest in the same movements when the procedure is novel, but will soon lose the interest in them, the benefits appearing too vague and remote. The teacher must knit some special interest to it, if the child shall benefit from it. He must be able to awaken and maintain the interest of the class directly in the work. If not, the pupils will look upon it simply as an additional and disagreeable task put before them by the school or the parents, and the gymnastic lessons become merely a means of further increasing the

over burdening of the pupils from which they now frequently suffer, not so much on account of the great amount of work done, as because of bad methods of instruction. The value of gymnastics under such conditions becomes minimized. Instead of being a blessing, it becomes a bane. A dry, solemn performance of certain definite movements is no more gymnastics, as it should, ought and can be, than memorizing the names of the Presidents and the dates of battles is history. Of educative power, of development—all force, there is none. If that is the kind of gymnastics offered, it is far better to have it struck from the curricula and the advertising circulars of the school. By it we do not make an able and happy race. We are killing souls. Every teacher ought to take to heart the lesson conveyed by Mark Twain in the description of Tom Sawyer whitewashing the fence. There we have it vividly depicted how a mere mechanical labor, a toil, a drudgery, a monotonous grinding, a really shameful occupation for any boy with self-esteem, according to Tom's view-point, rapidly changes its character, and becomes a pleasure coveted by every boy in the town, to take part in which they gladly give up their treasures, and this simply because of Tom's ability to put it before them in a new light. There is no more fun in mov-

ing one's arms, legs, or body in this way or that, than there is in whitewashing a fence. Both may, however, be made immensely interesting to the average child, if we have the power to surround them with some influences which hide the essential character of *work*, that is the obligation of performance, and make it appear in the garb of pleasure. A healthful, pleasant, joyful spirit must fill the otherwise empty forms.

What means the teacher shall employ to arouse and maintain the interest of his pupils, to awaken in them a desire to take part, and make them regret when they, from some reason or other, are obliged to miss a lesson, no one can say definitely. It lies with the individual teacher. It depends on his personality. The very best teacher is unable to give a prescription suitable for another. There is no highway leading to success except the one we blaze for ourselves. There is no formula to be followed, no method that suits all. Method there must be. But not a cut and dried one, transferred from one individual to another. The method you use must be your own. All that can be said is that if you are going to be successful, if you are going to carry your pupils with you, you must let the work carry you. To interest others, you must be interested yourself. You must put your soul into

the work. That is at the bottom of it,—your soul. If you go listlessly and carelessly to your work, it does not matter how deep your knowledge may be, it does not matter how good a gymnast you may be, your class will dwindle and disappear, if a voluntary one; will feel tired and fagged out at the close of the lesson instead of being refreshed, if an obligatory one, and the work done may not have been half the quantity it might have been. The pupils have come to you seeking bread; you have offered them stones.

When you see one teacher using one means successfully, it does not mean that the same method will suit you. What is good for one may be ruinous for another. Imitations are inferior to the model, copies to the original. If you are not successful in your teaching you must not throw the responsibility for your lack of success upon those above you, who have refused you this or that external help. The main source of interest does not lie in this or that apparatus, this or that kind of room; it lies in your own personality. If you cannot make that personality tell upon your pupils, you probably could not use the means you seek. A smile, a word of encouragement, a jest, an inflection of the voice judiciously employed may make all the difference between success and failure.

Have you used them? Originality, personality, individuality, love,—these make the good teacher. And they cannot be transferred from one to another.

But we are, even at best, pretty imperfect and need well to draw from the experiences of others. We need to learn from each other and to see whether the means used by somebody else would not fit us. I once heard one teacher say that she relied quite a little on tea-parties and mothers' meetings. I do not think that that would suit me. I would rather have children's meetings without the tea. The means recommended can never be panaceas. They are only examples. Of them you may choose one, several, or none according to your nature. They do not by themselves create interest. You may be successful without them. You may fail with them.

One such means commonly recommended and employed in this country is musical accompaniment to the exercises. Nowhere else is music used in the gymnasium so extensively as in the United States. The Germans use it far less than the Americans; the Swedes still less than the Germans. But no school is opposed to it on principle. Music has been said to be absolutely condemned by the Swedish gymnasts as an accompaniment to exercises.



Fig. 28.

A writing posture which should result from gymnastic training.
(See page 52.)



FIG. 29.

A writing posture commonly seen. (*Compare with Fig. 28.*)

That is not true. It is true, however, that the Swedes consider music to be very much abused, and they in that regard have the support of the Germans, even though the latter do not go so far in their statements. It is, however, of less importance for us to know what the upholders of this or that system believe as to music, than to establish what are the actually known facts as to its influence.

Music has been known from time immemorial as a stimulant to action, and also as an agent depressing the motor activities, according to its various nature. It does not matter what our beliefs may be as to its usefulness in the gymnasium. Its strong influence upon the bodily movements cannot be denied. But our knowledge is rather indefinite. Experiments have been made, but their results have added very little to the general knowledge we possessed beforehand. The following facts seem to be more or less definitely established:

(1.) The strength of the muscular contraction may be increased by any sound made simultaneously with it.

Thus a person may squeeze a dynamometer with all his power and note the deflection of the indicator. If now a gong is sounded, or a note struck on the piano while the effort is made, the deflection

will grow, showing advanced intensity of contraction.

Observations of that kind are mentioned in every hand-book of experimental psychology, and may easily be verified by anybody.

(2.) The increase of strength thus shown is not dependent merely on the existence of the sound, but on its intensity, growing with the latter. Numerous experimenters have made observations on this.

Féré, for instance, placed his subject at different distances from a tuning fork, thereby varying the intensity of the sound, and found

at a distance of 8 meters	a contraction of 22 units ;
at a distance of 7 meters	a contraction of 22 units ;
at a distance of 6 meters	a contraction of 24 units ;
at a distance of 5 meters	a contraction of 29 units ;
at a distance of 4 meters	a contraction of 32 units ;
at a distance of 3 meters	a contraction of 35 units ;
at a distance of 2 meters	a contraction of 45 units ;
at a distance of 1 meter	a contraction of 48 units ;
at a distance of 0 meter	a contraction of 52 units ;

These experiments by Féré as also those the results of which are given in the next table were made on hysterical patients, which no doubt explains the great discrepancy in the strength of muscular con-

traction under varying nervous influences. It is safe to assume that experiments on persons with greater nervous stability would give very much less marked results, though we have many indications which should make us expect results in the same directions.

(3.) The intensity of the contraction is also a function of the pitch. The intensity of the sound remaining unchanged, Féré found the following variations from the use of one octave:

Ut ²	gave a muscular contraction of 26 units;
Re ²	gave a muscular contraction of 27 units;
Mi ²	gave a muscular contraction of 28 units;
Fa ²	gave a muscular contraction of 28 units;
Sol ²	gave a muscular contraction of 31 units;
La ²	gave a muscular contraction of 35 units;
Si ²	gave a muscular contraction of 38 units;
Ut ³	gave a muscular contraction of 45 units;

a fairly uniform increase with the growing number of vibrations.

(4.) A sound simultaneous with a muscular contraction not only increases its intensity, but also postpones the moment when further contraction becomes impossible because of fatigue.

If our dynamometer has been arranged in such a manner that instead of registering merely the

maximum pressure, its variations from time to time are recorded, it has been found that

(5.) The steadiness of muscular contraction suffers considerably from any outside stimulus.

The increase of strength noted under the first four headings may perhaps be explained as a result of the summation of the stimuli. The fluttering and unsteadiness is probably due to a diversion of the attention from the action to the outside stimulus.

As to attention and its influence on the movement, we know certain things definitely. The psychologists have expressed it in the phrase "A movement thought is a movement begun." In physiological terms, we may express it in several ways. For instance, "muscular contraction of a certain part causes an arterial afflux to that part." The mere thinking of the movement, the focussing of the attention on it, has the same effect, though to a less degree. A movement of my arm increases its sensory power. But so does the mere thinking of the movement. This is well known to psychologists. Attention to a movement decreases the reaction time, increases the strength, and increases the resistance to fatigue. All this under the supposition that the attention be not unduly prolonged. In that case, the opposite phenomena

appear. To make strong movements we must attend to them. Any influence which attracts the attention from the movement decreases its physiological effects. Now we know that

(6.) Music attracts the attention from the movement.

This, which I allege to be a proved fact, is disclaimed by many. It is said, "Practically there is little basis for this statement. Many teachers have found that greater attention is given the exercises because of the music and the rhythmic demand created by it." It is easily understood that those who use music should believe so. This belief is the reason why they employ it. I believe, however, that the discrepancy between us is due to the fact that we do not use words in the same sense. There are two factors which enter into the execution of a movement: its *form* and its *time*. No one denies that the music enables the pupils to follow a given rhythm more easily if this rhythm is punctuated by accompaniment. But this stronger attention drawn to the time-element we claim diverts and destroys the attention to the form. The matter for us to decide is, then: Which is the more important factor in a given exercise, its *form* or the *time* in which it should be executed?

(7.) We know that melodies affect movements

differently, according to the intervals in the octave, —those in the major key being stimulating, those in the minor key being motor depressing. Though investigations show that the main influence probably is that of pitch, already noted, varying intervals probably have some effects. Scripture exerted a maximum pressure of eight pounds during silence, which was increased to eight and three-quarter pounds under the influence of the giants' motive from the Rheingold, and decreased to seven and a half pounds by the slumber motive from the Walküre.

These are practically all the facts, which have been established, regarding the influence of music on exercises. They are brought forth here, not to serve as the basis for deductions, but to emphasize the results of our inductive experience.

What are these experiences?

(1.) A movement may be strengthened, executed with more force, if a sound is made simultaneous with it. This beneficial influence may be exerted by a word, a shout, a yell, as well as by a musical note. It is recognized by many an athletic trainer, who just at the moment when the student takes off in a pole vault, in a jump, or similar event, shouts an encouraging "lift," "up!" "get over!" or something of that nature. It is



FIG. 30.

A type of activity in which the ribs are held elevated while the abdominal wall is strengthened. (*See page 53.*)

found beneficial in a series of exercises, say of six to eight count, all to be executed successively on one command, that the teacher occasionally in the middle of the series suddenly counts "five," "six." This beneficial effect which corresponds to our first established fact is more pronounced if given suddenly and unexpectedly. Hence melodies played on an instrument will not serve this purpose as well as words, hand-clapping, or stamping. Music therefore is undesirable.

(2.) For the majority of exercises the *form* is of the utmost importance if best results shall be gained. If the *form* be violated, totally different effects from those expected may result. Full attention must therefore be given the *form* and only when the form is thoroughly ingrained and has become habitual can the greater part of the attention be focussed on the *time* element. Music reverses this condition. It is impossible to make, for instance, a trunkbending backward with feet separated and arms extended upward in the *form* which we consider the best one, to the accompaniment of music. It may of course be retorted that any form of exercise which does not adapt itself to a rhythmic execution is because of that very fact an erroneous one. But I, for one, consider that this is begging the question.

(3.) Whenever special stress shall be laid on the *time* element of exercises which naturally adapt themselves to a rhythmical execution, music is of decided benefit. This is the case with marches and running. They are naturally rhythmical. They shall be performed in definite form to be sure, but they are necessary or at least desirable at such an early stage that the pupils have not as yet acquired that amount of physical education which expresses itself in proper carriage, the maintenance of the straight ranks, the exact distances between the individuals. If for no other purpose than to move the pupils from place to place in the Gymnasium, or to relieve the tedium of being confined to one place on the floor, marches should be used already in the first lesson. To impress the time, music may well be used then, if the march be somewhat prolonged.

But it is a decided mistake always to use music in marches and running. It is desirable also to habituate the pupils to maintain the time element without that assistance. If we always rely upon the accompaniment, we make the pupils unable to maintain an even rhythm without it; we educate them for artificial conditions, which we have created in the Gymnasium, not for the natural conditions of daily life, where we are to walk without

music, and where we ought to do it in a suitable rhythm in order to avoid unnecessary expenditure of energy.

(4.) Music is furthermore of value in such exercises where the form has been so thoroughly incorporated in the nervous mechanism that no attention whatever need be paid to it, because it cannot be changed without a special effort of will, it has become second nature. That is the case in the marches and running of the well trained gymnasts. Here the music is not needed for the sake of the rhythm. Its value lies in its general stimulating influence. The influence which we saw the giants motive from the Rheingold gave Professor Scripture. That was the influence that the Marseillaise gave the French revolutionists. That was the benefit our soldiers received from "John Brown" and "Marching Through Georgia." That is the value of music at our balls, the frequenters of which under this influence do an amount of work which is many times as great as that which would be possible without it.

If we are utilizing memorized drills of any kind, such as are frequent in Gymnastics with Indian Clubs, dumb-bells, wands, or other portable apparatus, in fancy steps, dances, etc., and the forms have been mastered to such a degree that no serious

mistakes are committed, music may well be used for the same purpose.

(5.) Music may furthermore be used with advantage in such exercises, which, though not necessarily rhythmic in character, are more or less consecutive, and of a nature which brings them somewhat close to applied Gymnastics in a narrower sense, to sports, and games, and play. Such are a number of exercises on the parallel and horizontal bars, tumbling, climbing, vaulting, etc. This group approaches closely the memorized drills just spoken of. In their completed forms they do not consist of distinct well defined movements following each other in a given cadence but one movement imperceptibly passes over into the succeeding one. It is not possible then that the rhythm of the music shall impress itself upon the exercise, destroying its form, but by the general stimulus gained, more strength will be developed in the execution, more endurance, more general ability.

One writer who did not recommend the daily use of music in Gymnastics defended it in exhibition work upon the plea that "when the Gymnastic work of the school room or the Gymnasium is to be exhibited before the public eye, it must be presented in a different way from that of the every day

routine," in a manner which is more pleasing and attractive. This is a view which ought to be deprecated. It savors too much of the circus or the vaudeville stage. When work is shown to the public it should be shown exactly as it is taught. It should be a sample of the routine work. It should not be specially prepared, and decked out in ornaments to attract by false pretenses. The Gymnastic material should not be arranged any more "thoughtfully and artistically," during exhibitions than during the every day lesson. The lesson is of more importance than the exhibition, as the pupil is of more importance than the on-looker. Nothing extra must be taken into consideration to produce the desired effect upon the latter. The public should be made welcome to see the work as it is actually given. If they demand anything but that, they should be referred to the circus, where everything is done to supply a feast for their eyes.

Music has thus a definite though limited value in the Gymnasium. We have hitherto spoken of instrumental music. The question still remains to be considered whether vocal music has any place in the Gymnasium. The question is legitimate in as much as some teachers allow their pupils to sing during their exercises. Without entering into a

lengthy discussion of the matter, we may easily agree that song is unsuitable for all such exercises for which instrumental music is out of place. And its benefits are further limited. It may profitably be employed in marches and certain consecutive rhythmic exercises, like the milder forms of folk dances, certain games for children, etc. But as we should make the demands that the respiration must be free and unhampered during the exercises, it must not be employed in any exercises involving effort, nor in any where the movements of arms or trunk make special demands on the thoracic dilatation. To recommend singing with wrestling and boxing as one Hollander has done, seems to be passing into the realm of absurdities.

At least one director, whom I personally know, and whom I consider, as a rule, well defends her position in the front rank of our profession, has recommended, that one part of the class shall sing while the rest work. If this be intended as a rare occurrence, if it be done once in a month or so to add zest to the work, no criticism can be offered. Any occasional variation is permissible. But we are constantly agitating for the extension of the time to be devoted to Gymnastics. What then shall be said about any method which encroaches upon the admittedly too short time given us. It is



FIG 31.

If the feet are not firmly fixed, an attempt to sit up curls the body forward. (*See page 54.*)

our unquestionable duty to utilize every possible minute for Gymnastic exercises. To more or less habitually set aside part of the time for other purposes must not be permitted, though these purposes may be ever so desirable. Our pupils must be given Gymnastics during the whole period set aside by the school authorities for that purpose. It now happens in every class there is some time when a part of the class is not engaged in active exercises. But this time must be minimized. The class may be divided up in sections, each to be engaged in a different way, and if it is more or less impossible to keep all at work at the same time, the lesson should be so arranged, that the inactivity falls at such times when a physical rest is necessary. This is when the respiration has become somewhat labored, and singing exercises then are decidedly objectionable.

Another means recommended for the purpose of maintaining the interest of the pupils is frequent changes of the exercises. No one can remain interested in constant repetitions of the same exercises. Education means steady progress. The human mind is so constituted that it yearns for new experiences, and newness is in itself interest evoking. The child and the adult are alike in this respect. We frequently find the child repeating

over and over again the same movements, just as we frequently find when we have told a story to a child, that we are met with a "Tell it again." Professor Preyer's child took off and replaced the lid of a box seventy-nine times in succession. Dr. Gulick's baby dropped a block from his table to the floor some one hundred times, I think, the father replacing it each time. We all have had some such experience. But these exercises are not ordered, forced, commanded, directed. They are spontaneous. If we should endeavor to make a child repeat an exercise as frequently, we would utterly fail. This simply means that formal gymnastic movements directed in every detail are unsuitable for the small child because the child's interest cannot be knitted to them. Gradually, however, there can and should be introduced in the activity of the child more and more formality. This change must not be sudden. It must be a slow process. We should certainly not drop the spontaneous play and begin with a half hour or a quarter hour gymnastic lesson. Play must be a prominent part of the first lessons and it should recede for the more formal work very slowly. And in the formal elements of the lesson, there must of course be more freedom than for adults. And there must be great variety, as great a variety as possible.

In the adult, appeal may be made to indirect and remote interests, but the direct interest due to newness wanes in him even more rapidly than in the child, so that it is desirable to supply him also with a great variety.

Gymnastic exercises are of such great number, however, that no teacher master of his subject need fear running short of material. The principle of gymnastic selection of course bars out a large number of possible movements. But, as Ling expressed it, "Even the most careful selection of the most effective and most suitable exercises is erroneous, if it puts too narrow limits to the material."

The young teacher is apt to vacillate between two extremes in this regard, both equally injurious. He is either so diffident about using forms, which have not been used by his teacher, for fear of causing injury by erroneous selection, that he does not strike out for himself in any new direction but keeps in the path trodden by him under the direction of his teacher. Or finding the interest fading from some reason or other, he begins an ever ending chase for new forms, which sooner or later wrecks him on the rock of all possibility.

Whatever method we use in teaching, it is a fundamental condition for success that there must be interest, joy, and pleasure in the lesson. But

this is a condition for success only, it is not the end in view. We must not base our methods solely on a search for pleasure. We shall work for a richer, pleasanter, happier life. But life is not all pleasure. It is a mixture of good and evil. And our schools, and gymnasias should be miniature representations of life. If we only seek pleasure in our gymnasias, we tend to unfit our pupils for the seriousness of life. Let us strive for a feeling of pleasure in making efforts, efforts even in overcoming that which is unpleasant, but do not let us avoid the efforts themselves. These we shall seek. It is the overcoming of obstacles in life for which we work. It is to prepare for the serious business of life that the gymnasium exists. Our youth must be habituated to look seriously at life, at any task put before them. Let us by all means make the paths they must travel so easy that they do not get discouraged by failures. Let us surround them by sunshine. Sunshine flooding in into the innermost depths of their souls. But do not let us seek the sunshine merely in order to sit down in it. Let us seek it for the invigorating influence it has upon us, in order that we may do more, not less. Let the interest pervade everything we do. But let us not for the sake of the interest forget our duties as teachers and guides. Let us remember that we

should decide what the pupils should do, when they should do it and how. In other words let us maintain discipline. That is the second general demand which we make upon the methods. Discipline is necessary, and a very strict discipline at that. But not a discipline of the kind to which the old world soldier must submit, which blots out the individuality of the man and makes of him a mere automaton responding to the commands of his superior without thought, feeling or will. It must be a discipline in a higher sense, a self-willed submission to reasonable authority. The former kind of discipline, despotism, tyranny, bossism, is incompatible with interest, incompatible with development and growth, incompatible with education. The latter, on the other hand, cannot only be combined with interest, but is a result of interest, it is in itself a growth and development, an education. It is valuable not only because it permits us to do systematic work. Such may be done under autocratism but while the latter chokes what human traits exist in the pupil, the former cares for them and nurses them to their full development. To differentiate between these two kinds of discipline, to keep the one on the highest possible level, while avoiding the other like the plague, should be the constant endeavor of the teacher. It might seem unnecessary

to make this statement. It ought to be self evident. But it is necessary as long as there are many who sin against it.

Education means the bringing up of the individual to the highest possible degree of efficiency, so that he may be able to actualize his latent powers. But it does not strive for the actualization of these powers in any and all directions, but in certain definite directions. It means not only the rearing of power but bridling it, guiding it into channels which lead to a desirable goal, preventing it from overflowing into others. The skilful, intelligent criminal has power in abundance. It is only misdirected. We must rightly guide those under our care. Hartwell expresses it, "We must work towards the formation of proper habits of action."

But habit is the result of repetition, of doing over and over again the same thing, until the nervous processes involved have grooved out their paths of least resistance so well marked off from other possible tracks, that no overflow of nerve current can take place into them except when volition by a special effort opens the sluice gates. We should carefully scrutinize the possibilities and make our selection of gymnastic forms with the most rigid attention to the results which we wish to reach. When once we have chosen our means, the exercise,

as being the best among all possible ones for a definite purpose, then we must insist upon the utmost possible precision in the execution, and we must stick to it through thick and thin, remembering that every little deviation from the ideal makes less likely and less rapid the formation of the best habit as we understand it, and that it paves the way for incorrect habits. Precision is the third fundamental condition for success which must be fulfilled by our methods.

This does not imply that absolute perfection shall or can be demanded from the very first. If the pupils can do the exercise perfectly, it shows that they already possess the physical education represented by these exercises, and that repetition of them would be of small value for future development. They would mainly serve as means to retain the development already attained. But we must bring on a higher and ever higher development. This comes only from effort. Effort to reach just a short step beyond that which we now can do to perfection. The teacher must carefully avoid two opposite pit falls. He must not constantly drill and drill the pupils in such exercises as can be performed with ease. But he must make the advancement into new fields so gradual, that the pupil feels that there is needed just a little more effort to land

him where he wants to be. The precision in the new exercises shall be nearly perfect. What this "nearly perfect" means must be decided by the pedagogic tact of the teacher. In the gymnasium as everywhere else there are essentials and less essentials. Greater precision must of course be demanded in the former than in the latter. The difficulty lies in determining what is essential, and what is less so.

A concrete example of essential and less essential features: When the body is in the fundamental standing posture with the arms in the shoulder plane and extended above the head as high as possible, the posture is called the stretch standing posture. It will be noticed that there are three distinct conditions which must be fulfilled by the pupil in assuming this posture. But of these two are absolute, the third is relative. Absolute demand is made for the retention of the body in the fundamental posture and for the arms being in the shoulder plane. These are the essentials of the posture. To what height the arms are brought depends on the ability of the pupil. "As high as possible." This includes of course another absolute demand, a demand for effort. That is always an essential. If a pupil can bring the arms to parallelism, without changing the posture of the body and without allowing the



FIG 32.

When the prone body rests upon hands and feet, the lumbar curve often becomes exaggerated.



FIG. 33.

Contraction of the abdominal muscles corrects the error of form shown in Fig. 32.



FIG. 34.

The beneficial effects of trunk bending backward are lost unless it is performed correctly. (*Compare with Fig. 15. See page 85.*)

arms to go in front of the shoulders he must do so. It is the ideal to which we strive. Nothing less should be demanded from him. But if he cannot reach parallelism, a certain amount of divergence is permissible. We seek to gain a definite form but the form is not sought for itself. It is only the means by which we hope to gain certain effects. The chief effect which we wish to get from this posture is a tension in the tissues running from the front side of the thorax to the arms combined with contraction of those on the hind aspect, which shall result in increased mobility of the chest and greater control of the shoulder girdle. We gain those best by the absolute demand for the two features and effort in the third.

One writer has expressed the value which he attaches to precision by saying that precision is necessary in order "to give pedagogic value to work." Another writer disapproves this, saying that "It is difficult to appreciate what is meant by 'pedagogic value.' The term has rather more sound than significance." I believe on the contrary that this phrase has the greatest significance. It means to me a recognition that slip shod work is destructive instead of developmental. It means a recognition of the well-known fact that nervous impulses during a low stage of development tend to diffuse

themselves over large areas, and that the higher stages are marked by proper localization. It recognizes that attention and will are necessary in learning new movements. It means that he who consciously endeavors to do a thing as near to the ideal put before him as possible will secure benefits in being habituated always to doing his best. It means that there will be no necessity of reeducating an individual for the purpose of effacing errors which have become ingrained by practice. Precision is necessary to gain the best physical effects, and without precision practically no psychic development results from the exercises. The selection of forms differs according to the system we believe in, according to the standard we have chosen, according to the principles which move us. But there must be a selection of forms which seem to us best for our purpose. To demand precision in these is absolutely necessary.

Whatever our methods, how different they may be according to our different personalities, they must all have these three characteristics in common: they must create and maintain interest; they must create and maintain discipline; they must recognize the value of precision.

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